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THE "LIME DYKE," HALL CREEK, TROUT LAKE DISTRICT.

LOOKING DOWN HALL CREEK, FROM NEAR THE "WAGNER GROUP," TROUT LAKE DISTRICT.

ROYAL ONTARIO MUSEUM
OF
MINERALOGY

ANNUAL REPORT

OF THE

MINISTER OF MINES

FOR THE

YEAR ENDING 31st DECEMBER,

1897,

BEING AN ACCOUNT OF

MINING OPERATIONS FOR GOLD, COAL, ETC.,

IN THE

PROVINCE OF BRITISH COLUMBIA.

VICTORIA, B. C.:
Printed by Richard Wolfenden, Printer to the Queen's Most Excellent Majesty.
1898.

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REPORT

OF THE

MINISTER OF MINES,

1897.

To His Honour Thomas R. McInnes,
Lieutenant-Governor of the Province of British Columbia.

May it please Your Honour:

The Annual Report of the Mining Industries of the Province for the year 1897 is herewith respectfully submitted.

JAMES BAKER,
Minister of Mines.

Minister of Mines' Office,
20th February, 1898.

REPORTS

-BY-

WILLIAM A. CARLYLE, PROVINCIAL MINERALOGIST.

-o-

To the Hon. James Baker,
Minister of Mines.

Sir,—I have the honour to submit the following tables of the mineral production of the mines of British Columbia; and also reports on the different mining districts in the Province.

In compiling the statistical statement for 1897, I have been greatly aided by the clauses in the "Inspection of Metalliferous Mines Act, 1897," that make it now obligatory for mine-owners to send in a detailed statement of the production for the year by the fifteenth of January, as I am now able to present almost perfect returns for the year ending December 31st.

From later and more correct information not available when preparing the report for 1896, some alterations have had to be made in the tables given in that report, so that it is believed that the following tables will be found as correct as it is possible to have them, and to be very nearly exact.

Henceforth, by means of the Act above mentioned, it should be possible to give very satisfactory and full returns for each year.

I have the honour to be,
Sir,
Your obedient Servant,
William A. Carlyle,
Provincial Mineralogist.

Victoria, B. C., February 15th, 1898.

MINERAL PRODUCTION OF BRITISH COLUMBIA.

METHOD OF COLLECTING RETURNS.

In the following tables the method followed in assembling the out-put of the lode mines is to take the mill and smelter returns *received during the year.* The smelter returns for ore shipped in December are often not received until February or later, and as this report has to be in press by then, it has been thought most expedient to follow the above plan, or to take the returns for ore *paid for*, or realized upon, during the year.

TABLE I.

TOTAL PRODUCTION FOR ALL YEARS UP TO 1898.

Gold, placer	$ 59,317,473
Gold, lode	4,300,689
Silver	7,301,060
Lead	2,971,618
Copper	521,060
Coal and Coke	36,626,585
Building stone, bricks, &c	1,350,000
Other metals	25,000
Total	$112,413,485

The following table shows the steady rate of increase during the past seven years, and of the marked increase during the past year of 1897. As stated before, the influence of lode mining begins to be felt in the year 1892, since when the rate of increase has been entirely due to the production of the metalliferous mines, as the out-put of the collieries has not increased.

TABLE II.

PRODUCTION FOR EACH YEAR FROM 1890 TO 1897 (INCLUSIVE).

Year.	Amount.	Yearly increase.
1890	$ 2,608,803	
1891	3,521,102	35
1892	2,978,530	
1893	3,588,413	21 %
1894	4,225,717	18
1895	5,643,042	33
1896	7,507,956	34
1897	10,455,268	40

Table III. gives a statement in detail of the amount and value of the different mine products for the years 1896 and 1897. As it has yet been impossible to collect the statistics regarding building stone, lime, bricks, tiles, etc., these are estimated for 1897, but not estimated for or included in the output for 1896.

However, although 1896 showed a very decided increase over 1895, 1897 shows a still greater advance in the production of *gold*, *silver*, *lead* and *copper*.

TABLE III.

AMOUNT AND VALUE OF MATERIALS PRODUCED 1896 AND 1897.

	Customary Measures.	1896.		1897.	
		Quantity.	Value.	Quantity.	Value.
Gold, placer	Ounces	27,201	$ 544,026	25,676	$ 513,520
" lode	"	62,259	1,244,180	106,141	2,122,820
Silver	"	3,135,343	2,100,689	5,472,971	3,272,836
Copper	Pounds	3,818,556	190,926	5,325,180	266,258
Lead	"	24,199,977	721,384	38,841,135	1,390,517
Coal	Tons, 2240 lbs	894,882	2,688,666	882,854	2,648,562
Coke	" "	615	3,075	17,832	89,155
Other materials			15,000		151,600
			$7,507,946		$10,455,268

TABLE IV.

PRODUCTION OF METALS PER DISTRICT AND DIVISION.

NAME.	DIVISIONS.		DISTRICTS.	
	1896.	1897.	1896.	1897.
CARIBOO			$ 384,050	$ 325,000
Barkerville Division	$ 82,900	$ 65,000		
Lightning Creek "	53,000	25,000		
Quesnellemouth "	51,100	35,000		
Keithley Creek "	197,050	200,000		
CASSIAR			*21,000	37,060
KOOTENAY, EAST			154,427	163,796
KOOTENAY, WEST			4,002,735	6,765,703
Ainsworth Division	315,626	440,545		
Nelson "	545,529	789,215		
Slocan "	1,854,011	3,280,686		
Trail Creek "	1,213,360	2,097,280		
Other parts	14,209	157,977		
LILLOOET			33,665	39,840
YALE			206,078	226,762
Osoyoos	131,220	142,982		
Similkameen	9,000	25,100		
Yale	65,108	58,680		
OTHER DISTRICTS			15,000	9,390
			$4,816,955	$7,567,551

*For Cassiar, the production of $25,000 in 1896 from Omineca was lately reported.

For more detailed statements see report on Slocan and Trail Creek Division.

PLACER GOLD.

Table V. continues the yearly production of placer gold to date, as determined by the returns sent in by the banks and express companies of gold transmitted by them to the mints, and from returns sent in by the Gold Commissioners and Mining Recorders. To these yearly amounts one-third was added up to the year 1878, and from then to 1895, one-fifth, which proportions were considered to represent, approximately, the amount of gold sold of which there was no record.

The gold out-put for 1897 shows no advance over 1896. This placer gold contains from 10 to 25 per cent. silver, but the silver value has not been separated from the totals as it would be insignificant.

TABLE V.

YIELD OF PLACER GOLD PER YEAR TO DATE.

1858	$ 705,000	1878	$1,275,204
1859	1,615,070	1879	1,290,058
1860	2,228,543	1880	1,013,827
1861	2,666,118	1881	1,046,737
1862	2,656,903	1882	954,085
1863	3,913,563	1883	794,252
1864	3,735,850	1884	736,165
1865	3,491,205	1885	713,738
1866	2,662,106	1886	903,651
1867	2,480,868	1887	693,709
1868	3,372,972	1888	616,731
1869	1,774,978	1889	588,923
1870	1,336,956	1890	490,435
1871	1,799,440	1891	429,811
1872	1,610,972	1892	399,526
1873	1,305,749	1893	356,131
1874	1,844,618	1894	405,516
1875	2,474,004	1895	481,683
1876	1,786,648	1896	544,026
1877	1,608,182	1897	513,520
		Total	$59,317,473

TABLE VI.

Since last report further information has been secured that has modified in some details this table as it then appeared, more especially in reference to the production of lead. This information of production in the earlier years is obtained from the "Mineral Statistics and Mines for 1896," Geological Survey of Canada.

PRODUCTION OF LODE MINES.

YEAR.	GOLD.		SILVER.		LEAD.		COPPER.		TOTAL VALUES.
	Oz.	Value.	Oz.	Value.	Pounds.	Value.	Pounds.	Value.	
		$		$		$		$	$
1887	......	......	17,690	17,331	204,800	9,216	......	......	26,547
1888	......	......	79,780	75,000	674,500	29,813	......	......	104,813
1889	......	......	53,192	47,873	165,100	6,498	......	......	54,371
1890	......	......	70,427	73,948	*Nil.*	*Nil.*	......	......	73,948
1891	......	......	4,500	4,000	*Nil.*	*Nil.*	......	......	4,000
1892	......	......	77,160	66,935	808,420	33,064	......	......	99,999
1893	1,170	23,404	227,000	195,000	2,135,023	78,996	......	......	297,400
1894	6,252	125,014	746,379	470,219	5,662,523	169,875	324,680	16,234	781,342
1895	39,264	785,271	1,496,522	977,229	16,475,464	532,255	952,840	47,642	2,342,397
1896	62,259	1,244,180	3,135,343	2,100,689	24,199,977	721,384	3,818,556	190,926	4,257,179
1897	106,141	2,122,820	5,472,971	3,272,836	38,841,135	1,390,517	5,325,180	266,258	7,052,431
	215,086	$4,300,689	11,380,964	$7,301,060	89,166,942	$2,971,618	10,421,256	$521,060	$15,094,427

See reports from Slocan and Trail Creek Divisions for more detailed statements.

TABLE VII.

Coal and Coke production per year to date.

Coal.

Years.	Tons (2,240 lbs.)	Value.
1836-52	10,000	$ 40,000
1852-59	25,396	101,592
1859 (2 months)	1,989	7,956
1860	14,246	56,988
1861	13,774	55,096
1862	18,118	72,472
1863	21,345	85,380
1864	28,632	115,528
1865	32,819	131,276
1866	25,115	100,460
1867	31,239	124,956
1868	44,005	176,020
1869	35,802	143,208
1870	29,843	119,372
1871-2-3	148,549	493,836
1874	81,547	244,641
1875	110,145	330,435
1876	139,192	417,576
1877	154,052	462,156
1878	170,846	512,538
1879	241,301	723,903
1880	267,595	802,785
1881	228,357	685,071
1882	282,139	846,417
1883	213,299	639,897
1884	394,070	1,182,210
1885	265,596	796,788
1886	326,636	979,908
1887	413,360	1,240,080
1888	489,301	1,467,903
1889	579,830	1,739,490
1890	678,140	2,034,420
1891	1,029,097	3,087,291
1892	826,335	2,479,005
1893	978,294	2,934,882
1894	1,012,953	3,038,859
1895	939,654	2,818,962
1896	896,222	2,688,666
1897	882,854	2,648,562
Total	12,081,687 tons.	$36,626,585

Coke.

1895-6	1,565	7,825
1897	17,831	89,155
	19,396 tons.	$96,980

The above table shows little change during the past year in the coal production, but a decided increase in the out-put of coke, of which the bulk has been shipped to the Kootenay smelters. All of this coke came from the coke ovens at Comox, Vancouver Island.

A new and important market for this coke is now opening in Mexico, where one shipload has already been sent to one of the large smelting works situated not far from the coast.

TABLE VIII.

PRODUCTION IN DETAIL OF THE METALLIFEROUS

District.	Year.	Tons.	Gold—Placer.		Gold—Lode.	
			Ounces.	Value. $	Ounces.	Value. $
CARIBOO						
Barkerville Division	1896		4,145	82,900		
	1897		3,250	65,000		
Lightning Creek "	1896		2,650	53,000		
	1897		1,250	25,000		
Quesnellemouth "	1896		2,555	51,100		
	1897		1,750	35,000		
Quesnelle Forks, Keithley Creek Division	1896		9,853	197,050		
	1897		10,000	200,000		
CASSIAR	1896		1,050	21,000		
	1897		1,853	37,060		
KOOTENAY, EAST	1896		1,054	21,076		
	1897	2,497	* 600	12,000		
KOOTENAY, WEST						
Ainsworth Division	1896					
	1897	5,556				
Nelson "	1896	30,160	275	5,500	236	4,720
	1897	50,014			2,076	41,520
Slocan "	1896	16,560			152	3,040
	1897	33,567			193	3,860
Trail Creek "	1896	38,075			55,275	1,104,500
	1897	68,804			97,024	1,940,480
Other "	1896	58	231	4,627	35	700
	1897	1,781	300	6,000	9	180
LILLOOET	1896		1,683	33,665		
	1897	755	1,874	37,480	118	2,360
YALE						
Osoyoos Division	1896				6,561	131,220
	1897	6,098	440	8,800	6,674	133,480
† Similkameen "	1896		450	9,000		
	1897		1,175	23,500		
Yale "	1896		3,255	65,108		
	1897		2,934	58,680		
OTHER DISTRICTS	1897	290	250	5,000	47	940
‡ Building stone, bricks, etc.	1897					
TOTALS	1896		27,201	$544,026	62,259	$1,244,180
	1897	169,362	25,676	$513,520	106,141	$2,122,820

* No returns of placer gold.

† Yield of platinum for 1897, $1,600.

MINES FOR 1896 AND 1897.

SILVER.		COPPER.		LEAD.		TOTALS FOR DIVISIONS.		TOTALS FOR DISTRICTS.	
Ounces.	Value.	Pounds.	Value.	Pounds.	Value.	1896	1897	1896	1897
	$		$		$	$	$	$	$
								384,050	325,000
						82,900			
							65,000		
						53,000			
							25,000		
						51,100			
							35,000		
						197,050			
							200,000		
								21,000	
									37,060
73,796	49,443			2,808,411	83,908			154,427	
116,657	69,760			2,291,451	82,036				163,796
								4,002,735	6,765,703
374,097	250,665			3,186,592	94,961	345,626			
524,578	313,697			3,543,237	126,848		440,545		
631,960	423,413	2,237,921	111,896			545,529			
961,124	574,752	3,453,644	172,682	7,291	261		789,215		
1,954,258	1,309,353			18,175,074	541,618	1,854,011			
3,641,287	2,177,490			30,707,705	1,099,336		3,280,686		
89,285	59,830	1,580,635	79,030			1,243,360			
110,068	65,821	1,819,586	90,979				2,097,280		
11,917	7,985			29,900	897	14,209			
116,657	69,761			2,291,451	82,036		157,977		
								33,665	
									39,840
								206,078	226,762
						131,220			
1,174	702						142,982		
						9,000			
							25,100		
						65,108			
							58,680		
1,426	853	51,950	2,597						9,390
									150,000
3,135,343	$2,100,689	3,818,556	$190,926	24,199,977	$ 721,384			$4,801,955	
5,472,971	$3,272,836	5,325,180	$266,258	38,841,135	$1,390,517		$7,317,465		$7,717,551

‡ Estimated.

THE PROGRESS OF MINING.

Figures speak for themselves, and the statistical tables just given show very clearly the steady but gratifying growth of the mining industry in this Province.

The results are so far not startling or phenomenal, but the increase of the out-put of the lode mines from $100,000 in 1892 to $7,050,000 in 1897, or five years, with an increase of $2,750,000, or 65%, during the past year, commands attention.

That 1898 will see a substantial increase is now assured from the amount of ore now in sight in the different districts, and from the fact that the amount of customs returns for shipments of ore for January, 1898, were $1,193,458 as compared with $675,506 in 1897 (these shipments from West Kootenay only).

Increases. The increase in the amount of gold (lode) was 43,882 ounces, or 70 %; of silver, 2,337,682 ounces, or 75 %; of lead, 14,641,158 pounds, or 65 %; of copper, 1,506,624 pounds, or 40 %.

CAPITAL.

The interest of capital in the mineral resources of the Province has been aroused to a degree quite commensurate with what the mining regions are now prepared to show or offer, and in Great Britain a large amount of money is now ready to be sent here, provided good, business-like propositions can be presented. Not only are gold properties now greatly in demand, but also silver and copper, as the money-making possibilities of the high grade silver ores, as found in the Slocan, Ainsworth and other camps, are acknowledged by investors, but often ignored by speculators, who wish to cater to the public's taste for gold.

Such interest has been aroused that any district or property that can offer good inducements to investment will be examined and favourably considered, and when such a condition of affairs is reached, it then remains with the mining men to open up and prepare their claims for inspection.

MINING COMPANIES.

During the early part of the year, pending the enactment of the new Company's Act with more stringent regulations, a great many mining companies were registered with a capitalization that savoured of the ridiculous, but the payment of $50 or $100 for the licence on July 1st was more than a great many of these companies could stand, and they ceased to exist.

A good many companies, organized solely to make money by the sale of stock, as the public was then worked up to such a pitch as to be willing to buy almost anything offered, have suspended with no assets, as they never possessed anything except bonds or options on property or unworked locations.

However, strong companies, and the number is increasing, have been purchasing both "prospects" and developed properties or mines, and mining operations are becoming more extensive, and more thorough and substantial work is being done.

For the public in buying mining stocks, it must be very difficult to decide what to choose. In many cases a company is judged by the personnel of its directorate, by no means a sure and safe way, or else by the most tempting offerings in the prospectus of large and speedy dividends, according to the high values in large bodies of ore stated to exist on the properties of the company. The public buys this stock either with the hope of selling out on a rise, so many times engendered by skilful machinations, or for investment, and the offers of a company, if very brilliant and enticing, can often be correctly judged by the query that if these mines are so rich as claimed, why do the promoters wish to divide up such a good thing with anyone who will buy the stock.

To the public at large it may be well to state in reference to the mining resources of this Province, that they now promise to become yearly more valuable, that British Columbia can now claim a place among the mining countries of the world, and that with favourable climatic and natural conditions, excellent laws and good government, and rapidly extending means of transportation and cheaper treatment of ores, many opportunities for the careful and proper investment of money are now here afforded. But it is also to be remembered that this is no longer a terra incognita, that there are many here already closely watching for and prepared to purchase any good claims that may be discovered, and that it is quite absurd to suppose that any one, probably totally ignorant of mining affairs, can come here and in a few weeks pick up properties with phenomenally rich showings, as has been claimed by some who have come, bought and gone back to float companies by means of most specious prospectuses.

There are many good properties that, from surface indications and scanty development, promise favourably, but it is at once seen that capital must be got, and for such companies are needed, but when a company promises definitely large and speedy returns from properties with little or no development done upon them, the public should then be extremely suspicious.

The Province has been made to unjustly suffer for the deeds of a few such companies, which have quickly proved their inability to fulfil their glowing promises of quick and large returns, although in some instances, when proper work has been done, these promises may yet be redeemed.

Mining Development.

During the past year, much new work was done and much new territory prospected, but no important discoveries of ore were made in the new localities or on new locations, although, in the Nelson Division and along the coast, what may yet prove properties of great importance were being explored. On some of the older claims, new and large shutes of good ore were found, and some claims, hitherto unproductive, at the close of the year promised to join the list of shipping mines during the succeeding one.

Some districts were disappointing, as the comparatively limited work disclosed nothing; but progress in the Province is greatly retarded because so much presumably valuable mineral land can be located and held from year to year without the locators doing a stroke of work other than putting in the stakes. This is contrary to the law governing the location and possession of mineral claims, but the fact nevertheless remains that a very large percentage of claims is held from year to year by men re-locating each other's claims, and then deeding them back to the original holders, so that prospecting work, so very much needed, is not done, and men who would do work are kept out by an array of stakes.

Discovery Work.

To correct this serious and growing evil, the simplest plan is to require a certain amount of work to be done within ninety days after date of location. Some at once begin to cry out that this is an outrage on the poor prospector, who should be afforded every facility and protection in his arduous task of exploring these great mountain ranges. So he should; but he should not be permitted, as is now possible, not only to the great detriment of the country at large but to his own, to lock up great areas of country by simply putting up posts and paying a few dollars for recording fees. It will soon be more generally appreciated that if the progress is not being now made that should be, that the reason lies to a great extent in the fact that development is not being done over large tracts of our country that some such regulation as suggested would compel.

Prospects.

To the arduous work and privation of the prospector must be due the opening up of any mining region, but, without the aid of capital, his efforts will be discouraging and often fruitless. At the present time, with the interest now taken in British Columbia, capital will send its agents to the most remote and difficult parts, while many other countries are languishing for even a little attention; but these agents naturally demand that some work be done to enable them to form some judgment of the value and possibilities of the "prospect." During the past two years, many seeking mining property for strong companies or syndicates have found that their choice must be greatly confined to "prospects," or undeveloped properties, and as ore deposits very rarely display their charms on the surface, they have had to turn away disappointed in that so little was done on claims they might have been willing to buy at good prices.

In some districts, prices for property have risen to very high figures, even for mere locations, but this phase is gradually correcting itself, and as many owners now wish to join the great rush northward to the new gold-fields, they will be willing to sell their claims at more reasonable rates. This stampede to the north will take many from the southern portion of the Province, but an increasing amount of work will be here done, and investors waiting for a lull in the former high prices will return, so that, while the different mining towns will be quieter, mining will continue to advance.

Cassiar.

Into the northern portion of the Province, in Cassiar and Cariboo, long known as an almost untracked wilderness, will now spread a great wave of prospectors, with the consequence that trails and routes will be opened up throughout this vast domain, and what discoveries will be made none can foresee. In earlier days were seen gold excitements at several points, but quartz ledges were not looked for and ignored, but now both placer and lode mines will be eagerly hunted for. Quite a number of men have in the past ventured into parts of these fastnesses, to return with favourable reports that were then not listened to, but will now be willingly received. The two railroad companies, with large land concessions, are preparing to offer large inducements and rewards to prospectors who will enter their territory and may find placer ground or mineral-bearing veins.

Hence the activity in the north will be great, and the discoveries may be of great value.

GOLD.

Gold is obtained either from the gold-bearing gravels of the placer mines or from veins or lodes, and after these methods:—

(*a.*) By smelting ore from the veins or lodes;
(*b.*) By milling and amalgamation, together with cyaniding, of quartz ores;
(*c.*) By placer, hydraulic mining or dredging of gravels.

Smelting Ores.

Gold ores, not amenable to amalgamation or any of the wet processes, but profitably treatable by smelting to a copper-iron matte or base lead bullion and refining, are now the source of most of the lode gold produced in the Province, as at Rossland. By many who are only familiar with free-milling ores, the importance of these smelting ores is not appreciated, but their importance increases when it is learned that by this process a return of 95 to 98% of the assay value is guaranteed; that smelting charges are decreasing, and that with smelting plants becoming more easily accessible, the owner of a producing property of this class has not to incur the cost of a plant or mill to treat his ores, but can sell at once to the smelter.

Hence large bodies of sulphide, and otherwise refractory gold ores, carrying from $15 to $20 per ton in gold, as are being developed in the Province, are becoming profitable and, in some centres, will become more so when the railroads, building or projected, are completed. In Rossland, as stated elsewhere, the average *yield* value in 1897 for 68,804 tons was $30 48 per ton with a *net* value or profit of $12 to $16 per ton, which net value will, in all probability, soon increase.

In the Boundary Creek region the now low grade, gold-bearing sulphide ores may prove, on proper development, to improve in grade as is already promised in the work being done on some of the properties, and in other parts ore of this character may become available with easier access to the smelters. Again, ore of this class, too low grade to pay to smelt, may yet be found profitable by some wet process of treatment, for which experiments have not been exhausted.

Hence with the extensions of the railroad systems now building, cheaper coal and coke and better smelter rates, these smelting gold ores will become more profitable.

Free-Milling Ore.

Until recently only placer gold was sought out, and quartz veins received scanty and very desultory attention. Now, this search for free-milling gold ores has become more general, but so far the amount discovered has not been large, partly because there has not been time to determine by mill tests the values in the quartz veins found, most of which so far appear to be low grade, hence requiring most careful testing, and partly because enough work has not been done to disclose pay shutes.

A large amount of quartz has been found in Fairview and Camp McKinney in Yale, in Cariboo, in East Kootenay, in the Nelson division, in Lillooet and along the Coast and Coast Islands but, with a few exceptions, these veins as tested have proved to have low values. The "Cariboo" mine at Camp McKinney has a good ore shute that has paid $190,000 net; very rich free-milling ore was taken out of the "Poorman" lead near Nelson, and the "Fern" mine near there is now becoming a producer; but this class of mining has not yet made much headway, although the greater attention now being paid, the erection of stamp mills, etc., will greatly tend to prove up these leads, described elsewhere in this Report.

Mention has been made of the rush northward to search for quartz leads. Samples of good gold-bearing rock have already been received from there, and much quartz is known to exist.

Placer Gold. The annual output of placer gold for many years has not been large, but companies are now opening up hydraulic mining leases in different parts of the Province, and some very large work is being done in Cariboo, as described. During the past year some engaged in dredging on the Fraser have met, for the first time, with encouraging success, and as the conditions are better understood and more experienced men, with means and the plants best experience now recommends, attack this problem, the more hopeful it now becomes that the gold lying in these rivers will be at last secured.

Silver-Lead.

The silver mines of the Province produced by far the greater part of the out-put of the mines for 1897, and although silver is not now held in such high favour, its friends are getting handsome returns from the high grade ores, as produced in West Kootenay. With the notable exception of the silver-copper ore of the Hall mines, and some of the smaller properties, all of the silver ore carries a very high percentage of lead or occurs in galena, and in two or three cases, galena and blende.

During the past summer the rapid decline in the value of silver, that proved so disastrous to other silver countries, had little effect on our silver mines other than to check investment, as the ores were usually of such high grade as to leave, even at the lowest price, a good margin of profit. The price of lead rose considerably, but this increase was off-set by the increase of the export duty on lead into the United States, our best market, of 1.5 cents per ℔. on the gross lead contents in the ore.

So far all this silver-lead ore has had to be exported to the United States for treatment, but at both the Trail and Nelson smelters, lead stacks are being erected, and the smelting of this high grade lead ore will be attempted, provided "dry ore," or that containing less than 5 % of lead, can be got to intermix. So far the amount of this "dry" silver ore has been very small in this Province, and its discovery would greatly serve to simplify the smelting of these silver-lead ores within our own borders.

West Kootenay produced nearly all of this ore during 1897, the "North Star" mine in East Kootenay suspending shipments until the completion of the Crow's Nest Pass Railway. As stated elsewhere, the average net or *yield* values of 33,576 tons of the Slocan ore were 108.5 ozs. silver per ton, and 45.7 % lead, with a total gross value of $97.70 per ton, or $50 to $55 *net*.

Copper.

No large copper mines have yet developed. The production of 5,325,000 lbs. during 1897, came almost entirely from Rossland and the Hall mines at Nelson, the average *yield* value at the former being 1.32 %, at the latter 3.63 %.

Work is in progress on the, at present, low grade copper-bearing deposits in Boundary Creek district, and considerable prospecting was done at Kamloops, on the St. Mary's in East Kootenay, and on the Island of Vancouver and adjacent islands, especially at the "Van Anda" on Texada Island, whence several hundred tons of good grade bornite ore were shipped.

In these districts last named, the ore is usually chalco-pyrite in eruptive, diabasic rock, associated with pyrrhotite and sometimes magnetite. Small bodies of massive "yellow copper" ore have been uncovered, but for such ore to be profitable, there will need to be large bodies carrying a fair percentage in copper, and enough silver or gold, or both, values, for in mining large quantities, as would be imperative, the copper averages would almost certainly become low, hence requiring certain values in precious metals to make a total value sufficient to leave a margin of profit. In these districts some very promising discoveries have been made, and work is being begun upon them.

Coal and Coke.

The production of the Collieries on Vancouver Island was about the same as that of the previous year, but in 1898, the demand for coal should greatly increase in consequence of the very great increase in the number of steamers engaged in the northern trade. The coke ovens at Comox produced over 17,000 tons of coke, mostly for the Kootenay smelters, and large barges are being built so that the coke can be sent to the mainland in cars, to avoid re-shipment there.

The great fields of coal in East Kootenay will soon be available, as the railroad through the Crow's Nest Pass west to the Columbia River will be completed in another year, when coal and coke will be delivered in East and West Kootenay, and thus effect great improvement in the conditions affecting the smelting industry of the Interior.

Other Minerals.

Iron.

About 2,000 tons of magnetic iron were shipped from the Glen Iron Mines near Kamloops, to American smelters for a flux.

Platinum.

Some platinum was secured from the hydraulic and placer mines in Cariboo and Yale, and the Minister of Mines has asked for samples of black sand to be sent into the laboratory of the Department, where such will be tested free for platinum and iridium, for both of which are ever a good market and good prices.

Mercury.

The cinnabar mines in the Kamloops district have temporarily shut down, without proving anything yet of value.

DEPARTMENT OF MINES.

Work of the Year.

The Provincial Mineralogist began in May the field-work of the season in Yale, at Vernon, after which the gold-bearing quartz leads at Fairview and Camp McKinney were examined. Then the different camps in the Kettle River (or Boundary Creek) and Grand Forks Divisions were visited, and a Bulletin would have been then issued if the railroad projects had not been unfortunately deferred for that year, after which it was thought the report published at a later date, as now, would prove of equal service to this promising region.

In July, about three weeks were spent in Rossland studying the progress of mining there; after which a hurried inspection was made of the Trout Lake Division during a period of very wet weather; this season having been unusually rainy throughout the Province. Crossing over the range east of Kootenay Lake by the Pilot Bay Trail, a portion of the territory drained by some of the tributaries of St. Mary's River in East Kootenay, next demanded attention, and in August, after seeing the "Lanark" mine in Illecillewaet, a more extended period was spent in Cariboo, where nearly all the mining enterprises in progress were seen. About the end of September some of the properties on Cayoosh Creek, Lillooet, were inspected, and then the mineral area of Kamloops, after which, or in October, the Mineralogist returned to headquarters, at Victoria.

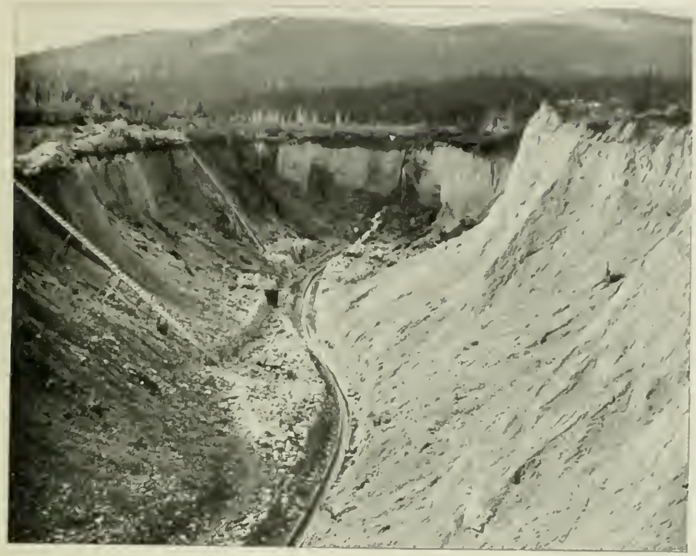
Two visits were then made, one to Mt. Sicker on Vancouver Island, the other to Texada Island, and in January a short trip was made through West Kootenay to expedite the collection of the statistics of the mineral out-put of the year.

Hence a large area of country, in much of which work is just beginning, was examined, and necessarily this work partook greatly of the nature of a reconnoissance review, so that a report on the general conditions of affairs could be made to the Minister of Mines.

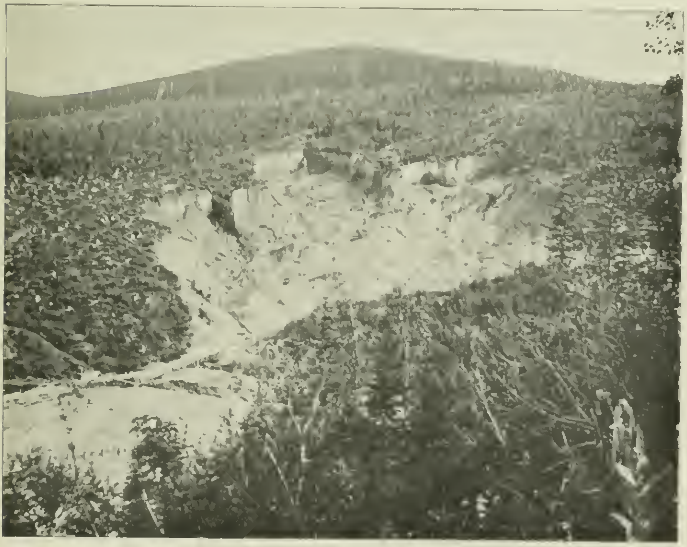
This report gives as full an account of the mining industry in the Province during the past year as has been possible, and by reason of its publication promptly after the expiration of the year, more careful revision and condensation of the various reports have been sacrificed to promptness of issue.

Offices and Museum.

On the completion of the new Legislative Buildings, the offices in the new building were occupied, and the former Legislative Building, now being completely overhauled, will make an excellent museum for the large and good collection of ores, minerals, rocks, etc., now waiting a place for display. Laboratories and class-rooms for the assayer and students will now be equipped, as well as new assay laboratories.



WAVERLY PLACER MINE, BARKERVILLE.



EYE-OPENER PLACER MINE, BARKERVILLLE.

Illustrations.

The illustrations of this report have been made from photographs taken by the writer, with a No. 1 Cartridge Kodak, and the excellent press-work in their re-production is due to the special care and attention of W. H. Clark, Chief Pressman for the Queen's Printer.

Acknowledgments.

The writer, the Provincial Mineralogist, desires to express his keen appreciation of the invariable courtesy and willing assistance of all those interested in mining with whom he came in contact, and also of the different Government Officials throughout the Province.

CARIBOO DISTRICT.

In the following description of the mining region of Cariboo, it is not the purpose of the writer to attempt the relation of the early history of this now famous section of the Province, but to describe the work now in progress and projected, and some of the conditions that there prevail.

Since the year 1858 to the present time it is estimated that over $35,000,000 in gold has been taken from the Cariboo gravel deposits of which two and a half miles of Williams Creeks yielded up over $20,000,000. The production of Williams Creek, Lightning, Lowhee, Antler, Grouse, Keithley, Hardscrabble, Cunningham, Mosquito, Nelson, and other creeks of those early days has become historic, but all these deposits, at present known, have long since been exhausted leaving only such propositions as the deeper diggings that abundant capital well expended, can alone grapple and make successful, or the old diggings and remnants to be worked and re-washed by the skilful and energetic Chinamen who always follow close after the white man to make money out of his prodigal leavings.

Other creeks and untouched gravels may yet be found in this region, although the prospector has been searching for many years, but only twenty miles from Barkerville, it is claimed, lies ground that has been but scantily worked; however, the intense interest now aroused by the great Yukon discoveries will lead many to explore a great extent of territory in this northern country yet untouched, to test many of the creeks by sinking to bed-rock where only the bars have been tried.

Lack of water at suitable elevations has long deterred undertakings that otherwise would be very profitable, as in the creeks above Barkerville is a large amount of good pay dirt that with water could be easily moved and made to yield handsome returns, while the old channel deposits in the Quesnelle District are just now being exploited. Whether this needed water can be supplied or stored is doubtful in many instances, but such will be quite possible in others if the means are available to build water-ways on a bold plan to bring water from long distances as was done in California.

After the cessation of work on Lightning Creek in the seventies, mining in Cariboo fell to a very low ebb until about 1893, when some new organizations with more or less capital began to explore these now practically abandoned placer and hydraulic claims and to prepare for mining on a scale not hitherto attempted, with the result that there has been a decided revival in interest, and besides these companies, other undertakings are under advisement, and if during the coming two years several undertakings that have now reached that point where they should either spell success or failure, prove to be successes, other companies will have little difficulty in raising funds to mine the deep gravels by drifting, or the higher channels by hydraulicing.

Location.

The Cariboo Division extends for 400 miles north of the Lillooet Division and east from the Cassiar Division to the Provincial Boundary line, but so far nearly all mining has been confined to a district of about two thousand square miles lying between the Fraser River that first flows north and then south. Access is gained by the excellent Government Road running north from Ashcroft, on the Canadian Pacific Railway, 210 miles to Quesnelle Forks, or 280 miles to Barkerville.

From May to November a bi-weekly stage, carrying passengers, mail and express, runs each way, stopping over at hostelries along the road where good meals and accommodation can usually be secured, while a weekly stage runs during the other months. During the period of navigation the stage is left for the steamboat running between Soda Creek and Quesnellemouth, making an agreeable change of 50 miles on the long ride to Barkerville. At Quesnellemouth the trails start for Omenica and Cassiar, and other points in the great wilderness to the north, while the stage-road turning sharply in the east runs about 40 miles to Barkerville. During the coming season this highway promises to become of a greater importance as a large number of men with their supplies may enter this northern country *via* this route, bound, not so far as Dawson City, but for the great stretches of untried country that are about to be more carefully explored.

During this last autumn, engineers for the Dominion Government examined the upper reaches of the Fraser and other water-ways north of Quesnellemouth to consider the amount of work necessary to remove several, but not very great, barriers to river steamboat navigation, by the removal of which barriers flat-bottomed steamers from Soda Creek will be able to penetrate much farther north.

TRANSPORTATION.

All merchandise, mining machinery, supplies, etc., are carried from the railroad at Ashcroft north, by the freight teams with from four to ten horses each, the former well-known bull-teams having now only one team left on the road. With good roads in good weather a team will go through to Barkerville in three weeks, but with heavy roads it will take much longer. Feed for the horses has to be carried, as such is often scarce and always very expensive, oats selling for 2 to 6 cents a pound, and hay from $50 to $125 per ton, according as the season has been favourable or not to the ranchers, who with such prices for their produce promptly paid when mining is in progress, are not very keen for railroad facilities. Since the revival in mining a few years ago, all land that can be cultivated or irrigated has been taken up along the road, and the past comparatively wet season saw bountiful crops, although the year before was a poor one and many cattle died last winter from lack of fodder, and the long, cold season.

Costs of transportation (as well as travelling) are high, so high that the freight charges on mining machinery and supplies are often more than the first cost, but the lowest freight charges can be got during the period of good sleighing in winter when there is a reduction of $20 to $35 per ton. In summer the freight charges to Barkerville are 5 to 6 cents per pound, to Quesnelle Forks, 4 to 5 cents, and to intermediate points in proportion.

Shipping Point.—Ashcroft is the headquarters of the B. C. Express Company which controls the transportation of passengers, mails and express, to the northern country. For freighting several concerns also make this point their chief base of supplies, and supplies can be forwarded by agents here or contracts can be made with the freighters themselves. During the past few seasons the greatly increased amount of freight has brought a very much larger number of teams on to the road, and besides the regular forwarding companies, there are many independent teams corresponding to the tramp steamers in marine shipping.

CHIEF DISTRIBUTING CENTRES.

Along the Cariboo stage road are many stopping places designated according to the nearest mile-post, and from 108-Mile House the road branches off to the mines on Horsefly River. At 150-Mile House is a distributing point of long standing, as from here freight passes on to Barkerville, or that for Quesnelle Forks and the mining companies on the Forks of the Quesnelle, is sent over a new road to Quesnelle Forks, a town that was established in the very earliest days, on the point of land between the North and South Forks. For many years after the wave of whites had passed on to the other diggings, a large colony of Chinamen was settled here, almost the only white man being Mr. William Stephenson, the Government Agent, but since the advent of these large mining companies this place has again become of some importance and now trails lead hence to Barkerville, Quesnellemouth and Horsefly.

Soda Creek, on the Fraser, is the point where the road leads into the Chilcotin country and a steamer can be taken to Quesnellemouth, when there is no ice.

At Quesnellemouth, where the Quesnelle River enters the Fraser, is an important distributing point, where large supplies of goods can be secured and taken by pack animals over the trails, or by small boats, at present, part of the way, into the Omineca and Cassiar and Peace River country, or goods sent into this point by waggon and steamboat are thus sent on. The main road also runs to Barkerville and Stanley.

Barkerville was the centre of very great activity in the sixties, in the heyday of the rich placer diggings, and now is the point from which some of the companies operate, and the quartz-bearing mountains can be reached. It is also the terminus of the Cariboo Road. Stanley, on Lightning Creek, is on the main stage road, but is very quiet since the cessation of mining on this creek.

Geology.

In the report of the Geological Survey of Canada, 1887-8, are contained the results of the geological investigations of Amos Bowman, M. E., from which the following brief sketch is taken :—

Physical features.

"A closer examination of the features of this region (the Cariboo) establishes the fact that north-westerly trends so remarkable for continuity and regularity in the region of the Upper Columbia, are here carried out in all the geological and physical details. The Cariboo Range, forming the north-eastern limit of the Cariboo country, is the north-westerly continuation of the Selkirk Range. The crystalline schists or 'gold belt' seen on Quesnelle Lake, is represented by similar rocks on Shuswap Lake and in Eagle Pass.

"The region of Mount Agnes (near Barkerville) and Snowshoe Plateau is an expanse of smooth and rounded flat-topped schistose hills having the same uniform north-westerly trend, and rising in Cariboo District to an altitude of a little over 6,000 feet. To the right and left of it, following the same trend, are low-lying valleys forming the present drainage channels of the country. These are occupied by recent deposits. Lying along side of them are ranges of hill occasionally rising into mountains, which represent valleys of an older date, *i. e.*, synclinals or troughs occupied by rocks newer than the gold-bearing series. The valley of the Quesnelle River, on the left or south-west side, is 4,000 feet lower than Snowshoe plateau, while the valley of Bear River and Bear Lake, on the right or north-east side, is 3,000 feet lower than the gold range.

"Two remarkable breaks cross the schists or gold belt, connecting the two valleys described. The valleys are occupied by streams characteristic of the present drainage system, and by lakes, Cariboo Lake and Quesnelle Lake extend, or formerly extended, entirely through and across the axis of the gold belt. These lakes, and the low lying valleys connecting them, are accompanied by narrow belts of level land; much of it is in the form of terraces or benches.

"Three-fourths of the territory of the Cariboo District is above the 3,000 feet contour. Snow lies on the ground above that altitude for four months in the year. Quesnelle Lake is closed by ice from November to March.

Geology.

"Approaching the Cariboo country from Ashcroft on the Canadian Pacific Railway the traveller passes over a region, extending from Cache Creek to Clinton, of chert rocks and limestones which have yielded fossils of carboniferous age, and which occupy the plateau in parallel undulations between the Rocky Mountains and the Coast Ranges. Passing the plateau of the 'green timber' (extending over a large extent of country) these undulations are seen to have been completely buried in places by a series of Tertiary clays, sands and gravels, capped by volcanic matter, and covered by drift of glacial origin and date. Underneath the Tertiary represented by the gravels and volcanic matter of the green timber are clays and lignites.

"Exclusive of the superficial deposits, the rocks met with in the Cariboo District may, according to our present knowledge of them, be classed as follows in descending order:—

"Cainozoic.—Pre-glacial gravels, Pliocene (?), basalts, clay-shales, etc., with lignites, miocene.

"Mesozoic.—Quesnelle River beds, argillites, agglomerates, etc., in part at least lower cretaceous.

"Palaeozoic.—Bear River beds, limestones cherty quartzites and beds of volanic material, probably in part Carboniferous.

"PALAEOZOIC (LOWER).—Cariboo schists, rocks more or less completely crystalline, of very varied character.

"ARCHAEAN.—Quesnelle Lake crystalline series, granites and granitoid rocks."

The geology of those parts of Cariboo visited during the past season by the writer may be briefly outlined from the same source, and the parts of greatest interest are:—

(*a.*) Quesnelle River and Lake region.
(*b.*) Barkerville region.

(*a.*) In the Quesnelle region much of this territory, especially to the south and west of the lake, is part of the great interior plateau, while on approaching the rivers the hills become mountainous, which to the east in ten or twelve miles form part of the main range. In this region we are most concerned in the auriferous gravel deposits lying in the ancient river beds, and the terraces of gold-bearing gravels found high up on the hill or mountain sides, which are not only being mined to-day by such companies as the "Cariboo Hydraulic," "Horsefly M. Co.," "Miocene Gravel M. Co.," etc., to be described, but have enriched the present river and streams forming the modern placer ground that has been, and still is, in a desultory manner, mined by whites and Chinamen.

Hence interest attaches to the formations of the Recent, Post-tertiary, Tertiary and Mesozoic periods.

RECENT.

"The low lying valleys of Beaver Creek, Quesnelle River and Bear River, and the higher valley of Willow River, are observed to have flats which are frequently a mile to two miles in width. Still higher-lying meadows than those of Willow River are found in places on nearly all the tributary branches at various altitudes. Usually these occur where the configuration of the country has led to the formation of the basins in the interrupted descent of the streams.

"The material of the recent deposits consists of the ordinary thin stratum of humus, or loam, over-lying very extensive bodies of sand and gravel. The latter were washed down from higher deposits of gravel and sediments of older date, and were bedded in the flats by the present streams.

POST-TERTIARY AND TERTIARY.

"The formations of the Post-Tertiary and Tertiary are unimportant as to the area covered and are superficial in character, but, in point of fact, the entire surface of the country is covered by Post-Tertiary detritus, blending into still older gravels, partly Tertiary, of as great, or greater, economical importance.

"The volcanic rocks of Tertiary age, which are so widely distributed over the Plateau, were noticed at only two points, viz.: on the north arm of Quesnelle Lake and at Guy's Mountain.

MESOZOIC.

Quesnelle River Beds.

"A large area which can be definitely referred to the Lower Cretaceous, accompanied by an old series of rocks (which may be Jurassic) occupies the trough of the Quesnelle River valley.

"This belt is crossed in travelling from Beaver Lake to Quesnelle Forks, and thence to Kangaroo Creek. It has an average width of sixteen miles, within the area of the map. All along the Quesnelle River, and at Cedar Creek on the lower Quesnelle Lake, this formation has yielded auriferous gravels. These were the first 'pay-gravels' discovered, and the first to be profitably mined in the Cariboo country.

"The prevailing habitus of the series is that of mixed volcanic and sedimentary rocks. Massive beds succeed each other with great regularity. The limits of the formation are:—Along Beaver River valley, on their south-west side, and along a line from Upper Swift River to Spanish Lake valley on the north-east side. The latter boundary extends in a north-westerly direction to Lightning Creek, below the Bonanza Mine, where it forms Red Canyon of Lightning Creeek, between the Bonanza and Boyd's Cold Spring basin. In the opposite, or south-westerly direction, it continues to Quesnelle Lake, striking the lake a few miles above Lynx Peninsula, thence eastward, it forms the south shore of Quesnelle Lake.

Aspect. "The hills composed of these rocks are much lower than those of the under-lying gold-bearing (Cariboo) schists on the north-east. Their surface is rough and craggy. Generally they are from two to three thousand feet lower than those of the gold-bearing schists.

Rocks. "The bulk of the strata constituting the group are chiefly the result of sedimentary deposition, while others are clearly of contemporaneous volanic origin, both molten and fragmental. Among these were found the characteristic conglomerates of the Shasta group. The cementing material is often a brownish or greenish mass. From conglomerate to breccia, with the same cementing material, they pass into a compact rock consisting of the cementing material alone. Sometimes this is crystalline and in massive beds, less frequently bedded. Of the mineral ingredients, aside from horneblende and feldspar, the crystalline varieties are frequently fine in grain and not readily determined without the microscope." (*See* Reports on the Cariboo Hydraulic Co., and the Miocene M. Co.).

(B.) Barkerville Region. Under this heading may be described, in short, the very important area of the "Cariboo Schists," in which the famous gold creeks of this district have carved out their basins and which carry the many but, as yet, unprodctive quartz veins. Dr. Dawson, Mr. Bowman, and other geologists and mining men believe these gold schists to have been the source of the gold in the great placer deposits, and the day may yet come when paying mines will be discovered among the many quartz veins in these schists, which hitherto have failed to disclose shutes of pay-ore. (*See* Report below on quartz veins).

Mr. Bowman has stated that these "gold schists of the "Cariboo Schists" occupying a belt sixten miles, with a probable depth of 5,000 feet, consist of very highly altered sediment clays and sandstones, with occasional bands of limestone and calcareous shales, comprising the well-known and characteristic 'slate rock' that varies from black to bluish shale to a more or less foliated grey or green chloritic or talcose schist, which to a great extent has been metamorphosed to the typical mica-schist, the most characteristic and widely distributed of the varities of the "Cariboo slates."

These rocks to a great extent are highly crystalline, thus distinguishing them from later formations, conform in strike to the general north-west trend and, being much folded, incline at angles varying from horizontal to vertical. In this excessive folding, from the lateral pressure that has caused this great schistosity, have occurred many fissures or fractures conforming in most part in strike with that of the inclosing rocks in which the large number of quarts veins have been formed, more particularly on the summits than in the lower lying or valley portions. Dykes of various kinds of eruptive rock are occasionally found. (*See* quartz veins below).

OPPORTUNITIES FOR THE INVESTMENT OF CAPITAL.

In the Cariboo Mining District are opportunities for the, probably, very remunerative investment of capital, provided that most careful investigation is first and always made of any property proposed to be mined, and of all the requirements and difficulties likely to be met with, prior to the commencement of regular mining operations. In most cases this preliminary work to determine the possible gold yielding values of the deposits, whether gravel deposits suitable to hydraulicing or to drift mining, or quartz ledges, will require considerable capital to thoroughly test such, as up to the present time, all known enterprises amenable to more limited financial means have been worked out, leaving only such undertakings as abundant capital alone can afford to attempt.

As described below, some strong companies are now engaged in large mining ventures that will greatly demonstrate in the near future what and where successful issues may be expected. If some of these prove successful, other and similar opportunities are here awaiting exploitation, and much property now held speculatively and awaiting the results of those being tested, will be available.

It is needless to specify that to embrace any such opportunities there are demanded:—First, abundant capital, and secondly men of undoubted experience, able to make the proper preliminary explorations, and then to work such property after the best possible manner that experience can dictate. Several enterprises here are now in the hands of thoroughly experienced men, past-masters in the kind of mining in which they are engaged, but unfortunately others have met failure, or will do so by reason of the fatal inability of the men in charge to correctly prospect the property, to foresee and forestall difficulties, to estimate the needed amount of capital, or to expend it to the best advantage.

THE POSSIBILITIES FOR SUCCESSFUL MINING MAY BE NOW OUT-LINED.

(A.)—HYDRAULIC MINING.

First—In the Quesnelle River District, the extensive auriferous gravel deposits in the ancient river system as yet betrayed only here and there, as at the "Cariboo" or "Horsefly" mines, or at those other points where little work other than enough to prove the existence of these gravels has been done, certainly merit careful investigation. Provided sufficient water can be obtained, as will be discussed below, gravel deposits known to exist almost beyond doubt, both north and south of the Quesnelle River, should be prospected, and the rich ground now being opened up in that portion of the channel known as the "Cariboo" mine should be a very strong incentive, although it does not follow that a deposit of gravel of this same period found a few miles distant, is necessarily part of the same channel, or carries any such values as this mine does. However, much of this gravel explored only in a small way, has proved to carry gold, and should be further tested, for with good dumping facilities now there, some of these deposits may prove to be very valuable if sufficient water can be brought into these claims, and probably the drainage area available within a radius of twenty miles may supply enough water for five or six hydraulic propositions. Some of these gravel deposits are described below.

Quesnelle Forks, *via* 150-Mile House, is the chief point in the Quesnelle region.

Second—In the Barkerville District, it is reported by many familiar with the ground, that along the creeks from which high values were mined out in early days, there remains a large amount of gravel that will pay well if mined by hydraulicing, but so far as these creeks are at a relatively high altitude, and near the sources of the water supply drawn from a very limited drainage area above, the supply of water is here very limited, or only available for four to six weeks when the melted snow fills the streams for a short time. For many years, hydraulicing, in a comparatively small way, has been done at several places while this rush of water lasted, with profitable returns.

It is claimed that a large supply of water might be brought fifty miles, but this would require much capital. In the lower parts of some of these creeks the hydraulic elevator might be used were water plentiful, and to work over a large amount of gravel in Williams Creek, below Barkerville, the Cariboo Gold Fields is now expending a large amount of money in ditches, flumes, sluices, &c., this company having secured the major part of the water supply of this district.

Annually, mining of this kind is done on Grouse Creek, at the "Waverly" Mine; on the "Black Jack," "Eye-opener" and "Forest Rose," near Barkerville; on Stout's Gulch, Lowhee and Mosquito Creeks; while the Chinamen are working some of the benches at several other points and cleaning up a few thousands of dollars every year.

Barkerville, chief point.

Thirdly—As the district now under report is only a small part of the Cariboo Division, new territory may yet be discovered, especially along the continuation of this gold belt to the north-west.

(B.)—DRIFT-MINING.

In these famous creeks the gold was found at bed-rock, sometimes at very little depth, as in the upper part of Williams Creek; but drift-mining was almost general, tunnels being run up stream or into the banks to tap the benches on the rims, or shafts were sunk 50 to 125 feet or more deep. Unless drained by tunnels some 2,000 to 6,000 feet long, all mines opened by shafts had to contend with a large volume of water in most of the creeks; and with excessively high freights and long delays, the miners were thrown back on their own resources and ingenuity, and with very little iron-work at hand, it is surprising how cleverly they handled, with really primitive means of over-shot water-wheels and Cornish pumps, such bodies of water.

With water and much very bad, soft or "running" ground, or "slum," these men contended against almost insuperable difficulties, but won, and among the Cariboo men was thus trained by hard necessity a band of miners patient, resourceful, and extremely skilled in working the most difficult kind of gravel diggings.

In working down these streams, as on Williams, Lightning, Antler and other creeks, the gold was found to be in much smaller grains and more widely scattered; and also as the creeks lost their grade and became wider, the water became far too much for any pumping appliances then to handle, and mining stopped here. Many futile attempts were made to bottom these channels, but water always drove them out, even though large pumps were put in, as at the Kurtz & Lane shaft on lower Williams Creek.

To-day some of these deep channels are being explored, and other enterprises of this character are under way. On Willow River, at the mouth of Mosquito Creek, Mr. Laird has pluckily stuck at his attempt to explore the deep channel of this river, the gutter of which lies nearly 110 feet below the present surface, and this winter, barring mishaps, should know whether gold in paying quantities occurs along the deep bed-rock. On Slough Creek, Mr. Hopp and Mr. Sargent, for their company, have maintained their struggle to bottom that deep channel opposite the mouth of Nelson Creek.

In this kind of work, the gutter or lowest point of the channel is ascertained by sinking a series of holes to bed-rock with some form of boring machine, the Jetting-machine, made by the Aurora Well Works, Illinois, having proved very efficient. Of course it is almost impossible to determine any values that may lie in these deep gravels by means of such small holes, but having located the deepest point in the cross-section, the next step is to sink a shaft in bed-rock so as to get at or immediately below this lowest point or gutter. By doing this work in rock the trouble of sinking in the soft ground is avoided, and not so much water has to be handled until the gravel is entered, and powerful pumps can be installed before the main water source is tapped.

In this manner, along many of the famous creeks of this district, such as the lower parts of Willow, Williams, Slough, Lightning, etc., are miles of channel awaiting exploration—it is true that nearly all such ground is now held under mining leases, but with no attempts being made to prospect them—and should any of the above enterprises prove successful, capital will be encouraged to exploit much more of this ground, from which, higher up the streams, so much gold was mined in the early days.

Of course, in this work, water will be the greatest factor to contend with, but with modern pumps and a lift of only 100 to 300 feet, a large volume of water can now be easily handled. In nearly all these channels is a stratum of boulder clay of greater or less thickness, and practically impervious to water, and if mining can be done without piercing this stratum the flow of water to be handled will be much less than otherwise by keeping out the surface drainage.

In the Quesnelle district, much interest has been aroused by the exploratory work being done by Senator Campbell near the Horsefly River, where he is sinking a shaft, now 250 feet deep, in the gravels lying in an ancient channel here discovered. Bed-rock has not yet been reached, but should this endeavour prove a success the continuation of this channel will be traced; then it should be invariably cross-sectioned with bore-holes to find the gutter, as, in the long run, this preliminary will be found to be the most economical, as the shaft can be sunk at the best point.

In sinking the above shaft, the flow of water has proved to be very small, the thick stratum of boulder clay again keeping out surface water. As described below, at the Ward Mine close by, the gravel bars there have been enriched where the modern Horsefly crosses this channel, leading to the expectation that this deep shaft will prove this channel, now located by holders of mining leases for miles along its supposed course, to be rich enough in gold to permit drift-mining with profit.

(C.)—PLACER MINING.

Placer mining, other than by means of large hydraulic plants for low-grade gravels, is now mostly confined to the work done by the Chinamen, who are taking out a decreasing amount of gold annually, and unless new diggings are found on other creeks, most of which, within a considerable radius of this district, have been carefully prospected, this class of mining will before long practically cease.

The beds of the various creeks in which gold has been found have been also carefully worked over, except in the very deep and rapid channels, but on the South Fork of the Quesnelle, a rapid flowing river of size in which much gold has been found, the Golden River Quesnelle Mining Co., by damming back this river where it flows from the lake, hopes to be able to thus lay bare this river bottom in long enough periods to permit the mining of those parts of it hitherto out of reach.

(D.)—DREDGING.

Some attempts, with very small success, have been made to dredge the bottoms and bars in the Upper Fraser and the Quesnelle, but as most of this work has been undertaken by inexperienced men, and with forms of dredges now known to be useless, very little of practical value has yet been determined as to the values in these gravels. In most of these experiments, the gold-saving appliances, on which success mostly depends, are reported to have been wholly inadequate. Gold dredging is now being carried on in many parts of the world, with some notable successes but many failures, but forms of dredges best adapted are now being better understood, and an important article on this subject is appended to this report.

A company was preparing to work on the Fraser, above Cottonwood River, with a dipper dredge, and another company has declared its intention of putting a number of dredges during the coming year on waters farther north, above Fort George.

There are certainly auriferous bars in many of these rivers, but no reliable data has yet been secured on which to base any further report. In nearly all such enterprises, a rapidly flowing current will have to be contended with, also in many cases deep water and boulders. Suction dredges have been tried but, as at every other place, these proved to be utterly useless, and to those interested in this kind of mining, attention can be drawn to the fact that experience now shows that bucket dredges are proving the only device suitable to the raising of gravel of such deposits to the gold-saving apparatus.

(E)—QUARTZ MINING.

During this visit a few of the many quartz ledges in these "gold schists" near Barkerville were examined. Mr. Bowman examined many more and has reported upon them in the Geological Report 1887, and to this report very little more can be added as very little work has since been done and nothing of importance disclosed. The discovery of free gold in the decomposed out-crops of some of these ledges has aroused periodic flashes of interest in these leads, but as no shutes of pay ore have been found this kind of mining has languished and, so far, always ended with no good results.

Although it is a well known fact that many rich placers have never betrayed the source of their gold, on studying the history of the gold-placers formed in the rich creeks that flow down from these mountains near Barkerville, one can hardly help but believe that this wealth of gold had its source close at hand, and that by the erosion of the veins and stringers in these Cariboo Schists, this gold was liberated and concentrated in these streams. For one reason coarse gold, much of which was rough and little water worn, has been found in greater or less quantity in nearly all these creeks where they ran down from these vein-crossed mountains, and invariably on descending these creeks the gold became finer in size and more scattered.

Veins.

The following are the chief conditions characteristic of nearly all these quartz veins :—

(*a.*) These veins, to a great extent, conform to the strike but not to the dip of the enclosing schists, but this rule is not general, some veins cutting across the schists ;

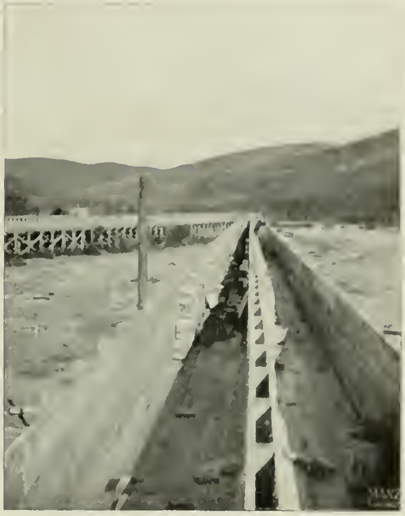
(*b.*) The gangue is almost invariably lustreless, barren, milky-white quartz (the same as found attached to the gold nuggets in the placers) often very hackly or easily crumbled ;

(*c.*) Much of the quartz, as in the large masses, is perfectly free of sulphides, but as a general rule it carries a small percentage of coarsely crystalline iron pyrites, usually along and near the walls, but also in bunches throughout the mass. A little galena is sometimes present but seldom zinc blende or copper pyrites. The amount of sulphides in some veins is 3 to 6 per cent. of the whole ;

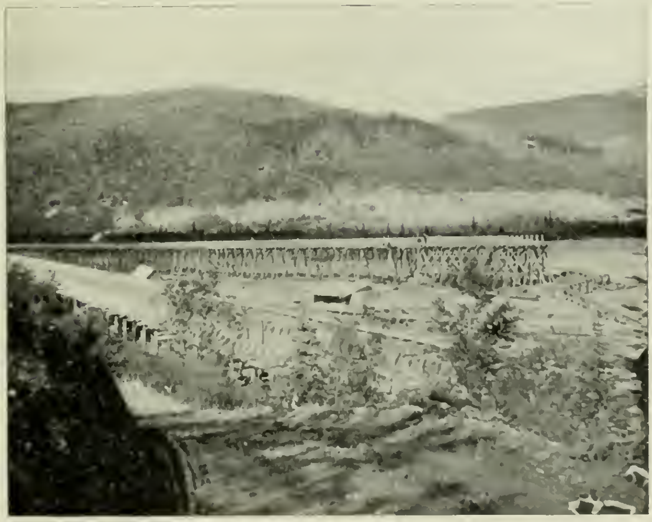
(*d.*) The values of these sulphides, when concentrated, in gold and silver are often found to be good, but not high ;

(*e.*) So far no shute of pay free-milling quartz ore has been found, although on several veins the decomposed top material, very limited in amount, has proved rich, but of many mill tests of ore from many of these ledges, the plates have seldom caught more than $1 to $4 per ton;

WILLIAMS CREEK ABOVE THE CANYON.



SLUICE BOXES FOR HYDRAULIC ELEVATORS.



SLUICE BOXES AND WASTE FLUME IN WILLIAMS CREEK.

CARIBOO GOLD FIELDS Co., Ltd., BARKERVILLE.

(*f*.) Some of these veins appear to be traceable by out-crops along the line of strike for one or two miles, but they are very much concealed by surface detritus and under-brush. These veins are irregular, sometimes swelling out to 20 feet or more in width, as in the "B. C." vein, then fading to a stringer, or series of both parallel and ramifying stringers. They are also, near the surface at least, much distorted and often faulted, but often continuous for several hundred feet, maintaining a fair width;

(*g*.) Often in the same gulch or creek gold of markedly different values was found, gold of a certain grade being confined to a certain section of the channel or bed in the gravel, and not much intermixed with that of another grade; very significant of its probable local source;

Again it is claimed that in some of the creeks where quartz veins were cut across, although to-day little or nothing can be found in such ledges, yet in the placer deposits there was a certain enrichment, often of a gold differing in value from that found in the other parts of the creek-bed.

(*h*.) Again, it has been found that (*a*) the schists enclosing these veins carry some gold values; also (*b*) that a band or zone of the schists may have a series of inter-banded as well as a reticulating system of very small veins or quartz stringers carrying gold and sulphides, very similar to the auriferous schists worked in the Homestake Mine in Dakota. Some work has been done on one of these zones which gave low grade gold values of $1 to $7 per ton.

Milling qualities.

(*i*.) If pay-shutes are found and worked, in all probability a certain amount of the gold will be free-milling or amalgamable, while that in close combination with the sulphides can be saved to a great extent when these are concentrated, by treating by chlorination or cynading, as is now done in so many parts of the world.

As already stated no shute of pay free-milling gold ore has been found in the Cariboo quartz veins, but the underground work has certainly not yet been such as to do justice to these prospects, or to absolutely determine that no pay-shute shall be found, as no shaft has reached a greater depth than 180 feet to show whether in depth values do not increase, or the amount of distortion and dislocation lessen, permitting these veins to be more regular. Considerable capital has been expended on some of these claims, but the work done has not been commensurate with the amount of money spent.

It is true that if pay-shutes exist here, they might be expected to crop out somewhere near the surface, and the discovery of only one such shute would at once encourage a far greater amount of thorough prospecting, but it may so happen that only work in depth will yet disclose this desired consummation, and with only a reasonable amount of capital some of these claims can be prospected to a depth of several hundred feet. During the past season work has been in progress on a number of claims, and M. Emile du Marais, M. E., representing a French Company, after securing bonds on a number of properties, and the use of the Government Testing Works, did some work on several claims near Barkerville, especially on one of the bands of gold-bearing schists, but getting results not sufficiently good to induce him to proceed, he has thrown up most of the bonds and discontinued work for the time being; but even this work, unsatisfactory in its results as far as it went, was far from being enough to demonstrate the latent possibilities in these veins, or to prove them absolutely worthless.

QUARTZ VEINS.

Mr. Bowman, in the Geological Report, 1887-8, 31-49 C, has described a large number of these quartz leads as examined by him on Williams, Lowhee, Mosquito, Lightning, Sugar, Grouse, Antler, Cunningham, Snowshoe, Harvey, Duck and other creeks, Island and Round Top Mountains. The writer also visited some of the claims crossed by Williams, Lowhee and Grouse Creeks, Stout Gulch, and on Island, Burns and Amador Mountains.

Williams Creek.

On the "Black Jack," in the shaft filled with water, a shute of ore, from which some of the best values had been reported, is said to be faulted, below which fault the vein has not yet been picked up. Near the top of the shaft a tunnel has been run in for a considerable distance in which the vein was seen to be split up into a series of stringers, but it is said some gold is found in the whole mass of vein-crossed schists.

On the "Porcupine" and "Steadman" ledges, nothing has been done for years, but on the latter a strong vein, 4 to 5 feet wide, of this very white quartz shows plainly.

Stout's Gulch.

"Winthrop" claim shows near the small creek irregular veins and stringers of quartz in the schists, and at one place a tunnel had been driven in to tap a large body of this glassy milk-white quartz, which had not continued down in depth.

The B. C. Mining Company owns three claims at the head of the gulch on the divide, between it and the Lowhee Gulch, the "Cariboo," "St. Laurent," and "American." This, known as the "B. C. Vein," runs magnetically east and west, with a dip of 72° N., and is, for several hundred feet of large width, one hundred feet of it being 35 feet wide, of barren-looking milky-white quartz. For a considerable length it is 15 to 25 feet wide, but again it becomes a mass of stringers in the schists. On the "Cariboo" claim is the chief work or a cross-cut tunnel 143 feet long, that intersects the vein 53 feet from the surface, where it has a width of 19 feet of the same kind of quartz, with a little iron pyrites. From this tunnel extend 170 feet of drifting, which, with three cross-cuts, show the vein to be continuous for this distance, with an average width of 20 feet. A shaft from the surface to this drift extends 60 feet below it, with a 65-foot drill-hole (diamond drill) in the bottom, all in quartz.

The quartz in this large vein carries from 4 to 5 % of sulphides, which on concentration are said to have assayed in making mill tests over $20 per ton, but so far all tests for free-milling gold have been very low, or $1.50 to $2 per ton, and in this large vein no pay shutes or special pay streaks have yet been developed in the amount of work so far done. All the machinery for 20-stamp mill, pans, settlers, three engines, etc., costing $61,000, were brought in over ten years ago, to be only stored away and kept in good order to the present time. A good site, with a fair amount of water for milling purposes and good timber, is available about 2,500 feet distant.

Last summer, to the west of this tunnel, a number of open trenches were dug to find the continuation of the vein which becomes much smaller, and holes were sunk with diamond drill, with results not ascertained.

Other but smaller veins were seen in this gulch.

Lowhee Gulch.

After leaving Stout's Gulch, several claims were seen in this gulch in which old miners claim is a large amount of good ground that could be hydrauliced, as there is excellent grade, but the supply of water is too small to permit other than a small amount of washing in each year, although it is said a fair amount of water can be brought to this gulch by a ditch from Jack of Clubs Creek. The hydraulic leases for most of this gulch are said to be under bond from Mr. Pinkerton to an English company represented by Mr. Rathbone.

The "Gold Finch" claim was being exploited by a Vancouver Company, and a tunnel being driven to strike a vein was in 100 feet, having cut through several small veins 4 to 8 inches wide and one 2 to 3 feet wide of the white quartz and iron pyrites. Other claims in this vicinity were being tested by this same company.

The Pinkerton Claim.—The schists are here cut by many small quartz veins and stringers heavily impregnated with coarse iron pyrites, in the decomposed out-crops of which considerable gold has been washed. A little work had been done, but none of these veins could be traced for more than a few feet before it ended or frayed out into stringers.

Grouse Creek.

About six miles east of Barkerville, where much mining was done in the early days, the cleaned bed-rock is seen to be traversed in many directions by a net-work of veins, but at the head of the creek were seen some large ledges.

Fountain Head.—Here a tunnel has been driven a few feet in a large exposure, 4 to 7 feet wide, of broken, rusty, honey-combed quartz carrying iron pyrites and zinc blende, but in another tunnel, lower down, the vein was only 10 inches wide if this tunnel has really gone in far enough to strike this vein that here cuts across the schists and slates.

"Lord Dufferin" and "May Flower" are old locations farther up the creek, on which a large vein of white quartz and a little pyrites crosses the creek. A tunnel on one side runs about 30 feet N. W. along the vein, 4 to 7 feet wide, until it is cut off by a fault, and a tunnel to the S. E. is in over 170 feet, following for part of that distance a wide vein of the same white quartz that cuts across the black slate. The vein appears near the face of this tunnel to be split up into stringers, or to have become very small, but the ground is concealed by the timbering. From a 10-ton test lot of this ore, Mr. Marsh is said to have got $7 to $8 per ton. No work being done.

Island Mountain. This mountain, lying between Willow River and Slough Creek and four miles from Barkerville, is traversed by a number of veins, upon some of which more or less work has been done, but only those recently worked were visited. However, in the past some very good material has been found on this mountain, the decomposed surfaces of some of the veins carrying considerable gold; but to date, in all the work done, practically little below the surface influences, the veins have been much disturbed and faulted, but they show the same characteristics already outlined, or an irregular persistence along the strike, of the same white quartz with 1 to 5 % of sulphides.

"Island Mountain Mining Company," Pres. C. T. Dupont, Victoria.

This property consists of three Crown-granted claims, two located along one vein, one along a second.

On the "Johns" claim are three tunnels, two of which, three-fourths of a mile by waggon road to the stamp mill, are each from 300 to 400 feet long, showing a vein very contorted and irregular in width of the white quartz and pyrites, for some distances 2 to 4 feet wide, then a series of stringers, but in one place 7, feet wide, but only for a few feet. The third tunnel, higher up the hill, was a cross-cut for 300 feet, wherein it struck the same vein which carries a good width at one place where an upraise has been made.

No work has been done here for some years, but from some of this ore good assays in gold are obtained, although the ore so far disclosed mills very low, or $2 to $4 per ton.

The claim west of this is owned by a French company, but no work has been done for seventeen years, when over 3,000 feet were done on a vein, from the surface of which gold was washed from the rotten quartz.

Little Giant Claim.—A 40-foot tunnel runs in on a barren-looking vein, 2 to 3 feet wide, of white quartz that carries very little pyrites, and 350 feet lower down the steep hillside another tunnel runs for 60 feet along the vein, which is there faulted, and although the tunnel has been extended 500 to 600 feet (without trying to pick up the vein along the line of faulting), the vein has not been found again.

Stamp Mill. This company, aided with a bonus from the Provincial Government, erected, nine years ago, above the stage road as it runs along Jack-of-Clubs Lake, a 10-stamp mill, consisting of (*a*) Blake crusher; (*b*) 2 5-stamp batteries (made by Prescott Scott Co., 1878, San Francisco; (*c*) copper plates; (*d*) 4 4x12-foot end-shake vanners; (*e*) engine, 15 by 30 inch; (*f*) boilers; (*g*) small pump for raising water from the lake. The buildings and machinery are now in comparatively good condition. This mill was run for a short time without vanners on ore from the claims just described, but with very poor results, and yet, after installing the concentrating machines, milling was attempted only for a short time further, when all work was stopped, and the mill has now stood silent for some years.

Burns and Amador Mountains, lying between Lightning and Jack-of-Clubs Creeks, and three miles from Stanley, the chief town on the former creek, are also crossed by a series of quartz veins, on which, in the case of Burns Mountain, considerable work was done ten years ago—veins much similar to those already described. On the north side of Amador Mountain, or overlooking the valley of Lightning Creek, is a series of veins, some 2 to 5 feet wide in places, on which some assessment work has been done during the past year, the quartz of which is as usual milky white, but with very little sulphide, and showing no free gold, which is only rarely seen in the Cariboo veins. Lack of time prevented the examination of many other quartz ledges, on which little or no work had been done, or none at all, for eight or ten years.

Silver-Lead Veins.

During the past two seasons, there has been some prospecting done on the Clearwater Lakes, the source of the North Thompson River, the prospectors going from Quesnelle Forks *via* the Quesnelle Lakes, and a number of claims have been staked off on ledges of quartz and galena carrying silver, from which very good samples were seen.

Water Supply. The future of this district depends now upon two factors: (*a*) the quartz ledges; (*b*) the water supply. Some idea of the former conditions has been given.

In the region about Barkerville, the supply of water is not great, for the reason that the creeks, with their gravel deposits, are already situated high up and near the sources of supply, so that only a comparatively small drainage area is available from which the waters may be stored. The elevation precludes the chance of bringing in water from a distance of at least fifty miles, as is claimed by explorers familiar with the region, hence hydraulic mining will not be possible where it is required to be of magnitude to make low grade gravels profitable.

During the short season of high water, all available water is utilized in washing small benches and other diggings, and, after this, most of the water supply at Barkerville will be diverted to operate the hydraulic elevators on Williams Creek. The summer seasons are usually very dry, so that the supply comes for the most part from the melting snows.

In the Quesnelle region all the possible water privileges, or drainage and storage areas where water can be taken at elevations sufficient to be useful in hydraulic mining, have been now located, except those, if such exist, that are over twenty miles distant from these gravel deposits on the Quesnelle, Cottonwood and Horsefly Rivers. Of these water rights located, probably water enough for eight companies using 1,000 miner's inches may be secured for part of the season, and two, perhaps three, of 2,500 inches and more.

No data as to the average rain and snowfall, extending over a number of years, exist, but as this region also has many dry seasons all the rain and snowfall of the fall, winter and spring months must be stored up in lakes dammed at their outlets or in valleys converted into storage reservoirs. In May and June there is a rush of water in every creek from the melting snows, supplying a good head of water into the month of July, but for the months of August, September and October the storage reservoirs must then be relied upon to make up the then very scanty supply. This falling off in the water supply in the months best suited to this kind of mining has so far proved very detrimental to hydraulicing, and the progress has not been possible that was at one time expected. In California, before hydraulic mining was restricted or practically stopped, water was brought in ditches and flumes for long distances, as 70 and 80 miles, and even 110 miles, and in this district good water supplies may be found lying farther away, which in time may be brought on to these gravels if development work, so very lacking at present, demonstrates that there are large gravel deposits in the Quesnelle District sufficiently auriferous to warrant such undertakings. The gravel in the "Cariboo" mine has already been proven to be exceptionally rich, for the extent and depth it has been tested, but a large supply of water throughout the working season of five months is demanded, but has not yet been secured, as a large amount of barren material has to be removed before the mine can be properly and safely opened up to permit the mining of the magnificent deposit of gravel.

If other enterprises are begun it will not be long before all the water in this district draining from that area above the necessary ditch lines will be stored up, and none whatever will be allowed to go to waste.

MINING OPERATIONS—(A.) QUESNELLE DISTRICT.

THE CARIBOO HYDRAULIC MINING CO.

This great mining property, certainly one of the finest in the Province, promises to prove one of the great hydraulic mines of the world from its wealth of rich auriferous gravel, ideal location and excellent conditions for mining, when once fully opened up and equipped for maximum work. As work progresses in the sluicing out of this buried ancient channel, as the large amount of boulder-clay (or perhaps volcanic mud) overlying the deep deposit of gravel and filling up the channel is washed away, the steep rim rock of the former river bank is bared, and the large amount of rich gravel exposed.

The property comprises eight mining leases, or 446 acres, that extend for 9,000 feet, or 1.7 miles, along this ancient river, and is located along the westerly side of the South Fork of the Quesnelle River, three miles from Quesnelle Forks, the stage road from the 150-Mile House passing close by the camp and mine. The capital stock of the company was originally $300,000 in $5 shares, but was increased in 1896 to $500,000.

Engineer in charge and Manager, John B. Hobson, M. E., Quesnelle Forks. Assistant Manager, L. F. Warner. Jr., M. E.

The Mine. The conditions that here prevail have already been described in various other reports, but a short sketch may prove of interest. Geologically the rock formations at this part of the Quesnelle District are eruptives, that immediately at the mine being, as stated by Dr. Dawson, a much altered and shattered green stone (diabase?) penetrated by syenitic dykes, and including a considerable body of syenite near the "China Pit." The present river, or South Fork, that runs about seven miles in a north-west direction from Quesnelle Lake to its junction with the North Fork at the town of Quesnelle Forks, has for a great part of its length many steep rocky sides, and as the pits of the "Cariboo" mine advance the old rim rock now exposed is found to be also very steep, or with an inclination of 45° to 50°.

As stated before, in the Quesnelle district, the modern placers or bars and low benches of the present streams have, without doubt, been enriched by the cutting through and erosion of these ancient river channels and benches, and in the early history of the placer mining on this South Fork a rich bar was worked at the mouth of Dancing Bill Gulch, down which flows a small stream which has been the great factor in the discovery of this great gravel deposit in that, in cutting its way down to the river, it is now seen that it has crossed the ancient river course at this point, exposing the gold-bearing gravels mined for eighteen years by Chinamen, whose excavation became known as the "China Pit."

This gulch is found now to possess a further significance. The old channel, it is believed, can now be traced for over one mile and a half in a direction nearly paralleling that of the South Fork, from which it is separated for most of that distance by a sharply pointed rocky ridge known as French Bar Bluff, and mining has now advanced so far that it is now believed by many that the channel turned abruptly across or into the modern one at the point above which Dancing Bill Gulch intersects, so that this gulch not only crossed the channel, but followed it on its turn into the river.

Old Channel. To the south-east the channel runs in a well-defined but at one time heavily timbered depression for about half a mile, where it intersects another depression, occupied by Long and Little Lakes, that run westerly to where Moorehead Creek enters the main Quesnelle River, the course, most probably, of an old channel, the relation of which to the Cariboo channel will only be determined by future explorations, as it may yet prove that the ancient river at one time ran through by this other course, but all must yet remain conjectural. A half mile south-east of Dancing Bill Gulch is another small creek that, running down Black Jack Gulch, again cross-sectioned the channel, but did not cut deep enough through the rim-rock to permit the exposal of the gravel, although, by shafts, the gravel there has been tested and found to be also rich in gold. Here the original "South Fork Company" did some hydraulicing after digging a ditch six miles long from Hazeltine Creek, but in these operations the gravels were hardly reached, only the heavy overlying sands and clay. Hence, when Mr. Hobson visited this part of the Quesnelle River the Chinamen, with a 5-inch pipe and 1½-inch nozzle, had worked out about an acre of ground and laid bare a face 300 feet high in their pit, and the mine had grown beyond their limited supply of water and small mining plant; but it was clearly demonstrated that a comparatively limited gulch digging was not here uncovered, but the rich channel of the much older river system, another clue to which was afforded by the South Fork Company, the members of which understood that they were attacking in Black Jack Gulch the same channel.

The Gravel Deposit. The total depth of material in the channel at the present point of working is about 400 feet, and a section shows—(*a*) at surface 10 to 12 feet of surface gravel carrying a small amount of gold; (*b*) underlying this a bed of very firm clay and rounded boulders, about 150 feet in thickness, perfectly barren; (*c*) bands of sand and fine gravel, auriferous, 10 to 20 feet thick; (*d*) lying on bed-rock a great depth, or 150 to 200 feet of exceptionally rich gold-bearing gravel, coarse in kind, containing a large amount of cobble-stones and a fair amount of boulders, mostly of eruptive rock, both massive and stratified.

On the surface the width is about 1,000 feet, hence the bed of gravel will be about 700 feet in width on top, or with 5,000 to 6,000 cubic yards per running foot, but near the opening at Black Jack Gulch the surface width from rim to rim is over 1,600 feet. Hence, there is a vast amount of pay-gravel in that part of the channel already known and now uncovered for about 1,600 feet for part of its width along the channel in the present workings, and although only the upper portion of this gravel has, so far, been mined in the present bench, the high gold values are constantly maintained.

In the section exposed in Dancing Bill Gulch, and about 75 feet below the lower or discharge end of the sluices, *i.e.*, the floor of the first bench, an exploratory tunnel has been run in along the bed-rock or bottom of the old channel, while in pit No. 2 two shafts have been sunk, and from the data now obtained it is seen that while rich gravel lies near bed-rock, the values are not concentrated there, that the gold is disseminated in very profitable quantities throughout the whole deposit of gravel with evident favoured "runs" in gold throughout the mass, especially near the inner curves of the channel. From the position of the boulders in the deposit, or up-end pointing down stream, Mr. Hobson believes the flow of the river was to the north or out in the direction of the present river, but as the lower bench is advanced the slope of the bed-rock will then demonstrate positively in what direction this ancient river flowed, and afford another clue to the study of this ancient system. The gravel is very firmly bedded, requiring a strong head of water to effectually break it up, but no sign whatever of cementing could be discovered.

Clay.

The great over-burden of clay has necessarily delayed the opening up of the mine, as this great mass has to be removed by hydraulicing before the gravels can be reached, and as this mass is very dense, and comes down in large blocks and masses that have to be "bull-dozed" or broken up by explosives before it can be swept into the sluices by the monitor, not only is a large quantity of water required, but also much time, labour and dynamite. The banks of the pitts stand perpendicularly, and a hard face forms on this clay stratum when exposed to the air, a fact that greatly aids in lessening the danger from caves into the deep confined workings. In breaking down this bank not only has water been used, but during the last autumn about 60,000 cubic yards were thrown down by sinking a shaft along the rim-rock, driving drifts, and exploding in them about 560 kegs of black powder.

Boulders, of which there is not a very large number, if too large to pass through the sluices, are shattered by having after first being loosened up, a stick of dynamite placed on top, or else two boulders are rolled together and the dynamite placed between and buried in dirt. Of course when the second bench is being worked off, these can be placed back on the bed-rock.

Gold.

The gold in this gravel is essentially a fine "coarse" gold, well worn and flattened, varying in size from small colours to that of flax and melon seeds, but large pieces worth $.50 to $4 are found, some also well worn, attached frequently to pieces of the milk-white quartz characteristic of all the vein quartz found in Cariboo. Little or no "flour" gold is found in these gravels. In the sluices a very small amount of platinum is found, and also water-worn fragments of metallic copper, besides worn pieces of iron and copper sulphides.

The workings.

The opening up of this mine has already required a large amount of capital, more than was estimated when preliminary calculations were made, but the difficulty of transporting, equipment and supplies was great and the freight charges heavy, as after leaving the main Cariboo Road there were 60 miles of execrable road, and much of the freight was so delayed that it could not be brought in on the better winter road but was detained until the spring when it had then to be taken in under heavy expense or else work at the mine had to be postponed for another year. As to drainage area or average amount of snow and rain fall, there are no data whatever, and to explore the country in search of water supplies, an almost impenetrable thicket had to be cut through. To-day, with roads and trails cut and rough places smoothed out, it seems a comparatively easy undertaking, and the past difficulties and annoyances cannot be fully appreciated. But, although in an unbroken country over two hundred miles from the railroad, Mr. Hobson, assisted by Mr. Warner, has clearly shown himself to be a past-master in undertakings of this character, as all the work so far done has been imperative and what the conditions demanded, and all such work has been done in the best manner, with a view to permanence and the correct method of mining; and while much of the work has been costly it has yet been done in the cheapest way, for thorough work in the first place always proves the most economical in the long run. That there is here a great property that will, when fully opened out, pay largely, is unhesitatingly believed by all who have studied the mine, and it will be many years before this deposit within the confines of this property will have been exhausted.

This property is almost an ideal hydraulic mine with excellent dumping facilities at several points of attack, but the only serious drawback is the depth of overlying boulder clay, to get rid of which is requiring much time and water to make a proper opening so that the channel may be attacked with maximum efficiency. With the great depth of deposit it has been necessary to work it off in two benches, of which so far only the upper one has been advanced carrying in it this thickness of barren over burden and 60 to 80 feet of rich gravel, and as soon as this upper bench is advanced far enough so that bench No. 2 can be begun with perfect safety, and this should be possible in one or two seasons more, the main mass of the gravel will be worked off down to bed-rock, and the receipts for the season will greatly increase, while the channel may be opened at two other points providing enough water can be secured to supply all the monitors that can there be used.

Pits Nos. 1 and 2 designate the workings of this mine. Pit No. 2, on the northerly side of Dancing Bill Gulch, lies in the bend or elbow of the channel. Pit No. 1, south of the gulch, is being advanced up the channel along one of the rims or steep banks, for about two-thirds of the width of the channel, and when more water can be put on, the mine will be worked to the full width, both benches advancing. To get rid of the water accumulating in the depression above the pits, a drainage tunnel has been driven through the rim rock so as to discharge in the south fork, and much trouble is thus saved in the mine, especially in resuming work in the spring.

Water supply. The main water supply is brought in a ditch seventeen miles long from two lakes, Polleys and Boot-Jack, where dams have been erected at their outlets to empound all the water that drains into them during the season, none escaping except of course by evaporation (these lakes covering an area of 2,200 acres). During the early part of the season the water from the various creeks is utilized, the reservoirs only being tapped when this supply ceases. Thus during the season of full supply, from 2,000 to 3,500 inches are available, but towards the end of August this is very much lessened and a constant flow of even 2,000 inches cannot be maintained. To further increase the supply, a dam, probably 35 feet high, will now be built across Moorehead Creek, whence another ditch, eleven miles long, will bring from this resevoir thus formed, a further supply of water in the latter end of the season when it is the most advantageous time for mining, but when so far the other water supply has greatly diminished or almost ceased. A large amount of water is needed to properly work this property on a large scale, especially in view of the large amount of barren material to be removed, but the present water-shed available to this company is not large, although this new work should greatly augment the supply and permit the hydraulicing of a greater mass of material.

Season. Work is usually resumed at the end of April, or during the early part of May, when a considerable amount of ice and frozen material has to be loosened up and worked away, as the frost loosens the banks and brings a large amount of dirt into the pits, which would have to be hydrauliced anyway. A full supply of water is now maintained until August; but during this month, September and October, the amount is so decreased that the monitors cannot be used continually throughout the 24 hours, but only work for a few hours in each shift, and in September and October only from 4 to 8 hours per day, so that the season is much shortened by the lack of water. To supply more water for use in the last months of August, September and October, and even into November, it is estimated that the water stored up in the Moorehead Reservoir can then be used to great advantage, and in direct proportion to the amount of water will be the amount of ground removed and gold recovered. Climatically the season is at least six months long in which mining can be done, but as yet the supply of water is too deficient to permit maximum work for more than three and a half months. Practically all the drainage available from which water may be collected for this mine has been secured, but one other source may yet be obtained.

Ditches. There are now 21 miles of ditch. The old ditch, six miles long, from Hazeltine Creek, is part of the series, and is gradually being widened and improved by lessening the curves and protecting the exposed banks from scouring by stone-walls or planking, as the grade of 10 feet to the mile has proved to be a little excessive for the material here traversed, which appears when first cut into to be firm and clayey, but proves to be open and easily washed away. At the lower end of this ditch the water is dropped 60 feet to a small reservoir, where a ditch runs to the mine, but it has since been continued on the same grade to the pit, giving extra head of water, which is used when a full supply of water is on. In the other direction the new ditch runs 11 miles to Polleys Lake, with a grade of 6 feet to the mile, a cross-section showing a depth of 3 feet and a width of 13 and 7 feet on top and bottom. This part of the ditch has been built very substantially, being thrown well into the bank with easy curves, and very little fluming is used, except on rocky faces and across very open ground. The maximum capacity is about 3,500 inches, and the cost per mile was from $6,000 to $7,000, one mile costing $15,000, but although the first cost of this ditch has been heavy no costs for repair have yet been entailed, and after mining for three seasons the ditch is in perfect condition. Strong but simple water gates are located at suitable points.

Pipes.

At the mine the high and low level ditches terminate at the sand or pressure boxes in Dancing Bill Gulch. From the upper, 360 feet above floor of present bench, runs a steel pipe, 48 inches in diameter, tapering to 30 inches in 50 feet, the 30-inch pipe continuing down to where the head is 180 feet; thence 24 inches into the pit and 22 inches in the string leading to the monitor where the inlet is 18 inches, throat 17 inches, and butt 10 inches. From the lower box two steel pipes, tapering to 22 inches, run into the pits with a head of about 300 feet, with branches so that in the two pits there are 4 lines or "strings" of pipe, 3 22-inch and 1 18-inch, or about 6,000 feet in all, equipped with 6 No. 8 hydraulic Giants or monitors with nozzles varying from 5 to 10 inches in diameter.

On bench No. 2, the head of water will be increased about 100 feet.

Gold saving appliances.

At the time of visit work was only being done in Pit No. 1, into which ran the main sluice, 400 feet long, with three laterals aggregating 950 feet, running along the channel. These sluices are 5 feet wide, 2 feet deep, above the paving of spruce and fir riffle blocks 12 inches deep, but in Pit No. 2, the width is 6 feet. Near the dump where the material discharges into the South Fork, the sluices empty into a paved enclosure, but where bench No. 2 is begun, more complete saving apparatus in the shape of iron riffles and undercurrents will be introduced. The sluices have a grade of 10 inches to the 12-foot box. Freight charges have prohibited the general use of iron longitudinal riffles, six sets being worn out in 1,150 hours in the lower part of the main sluice.

Mercury is used, about one flask per day, in Pit No. 1, when working with a full head of water.

Buildings.

(*a.*) In the camp are comfortable quarters or houses, stores, bunk houses, eating house, offices, etc. (*b.*) A new saw-mill for sawing and dressing lumber, for which all good timber near at hand has been exhausted. (*c.*) Good powder house. (*d.*) Blacksmith shop. (*e.*) Refining and retort house. (*f.*) Stables, etc.

Gold out-put.

Since the commencement of operations in 1894, about $335,000 in gold have been received, of which in 1895, $60,306.93 came from 210,000 cubic yards of ground, in 1896, $127,455.24 from 1,055,350 yards, and in 1897, $139,000 from an amount of gravel not yet made public. In the measurements of ground worked, the large amount of barren over-burden is not included, of which there will be none to handle in the second bench.

SUMMARY OF SEASON'S WORK, 1897.

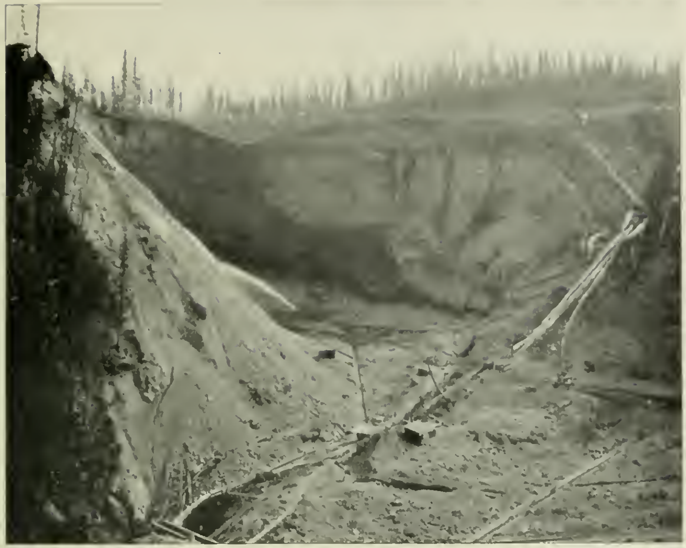
Yield.

Total time occupied in washing	111 days, 17 hours.
" quantity of water used	223,416 miner's inches.
" " gravel washed	840,130 cubic yards.
Gold product for season	8,078.1 ounces.
Value of gold	$138,559.76.
Yield per cubic yard of gravel washed	16.4 cents.
" day of 24 hours of actual operation	$1,244.63.
Average duty of water per miner's inch	3.76 cubic yards.

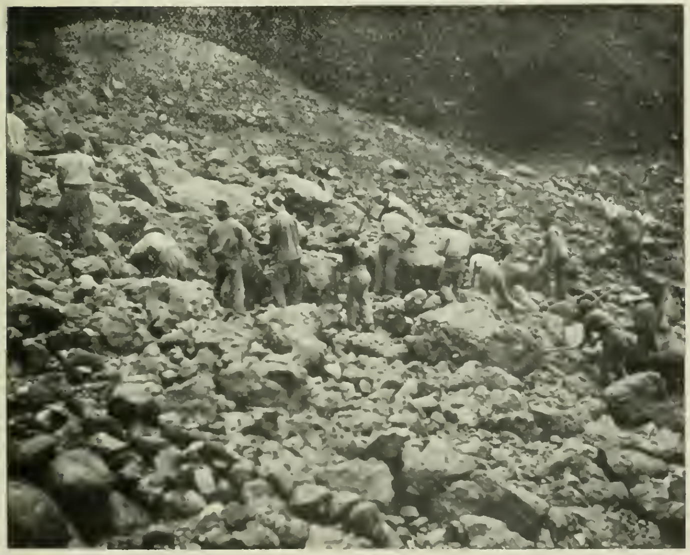
The above amount of 840,130 cubic yards of "gravel" includes by far the greater proportion of boulder-clay or barren over-burden or "top-gravel." Hence, if the yield were credited to the actual amount of gold-bearing gravel washed, the value per yard would be very much greater, or approximately the value of the material remaining in the lower bench.

Expenditures

The total cost of operating for 1897 was $91,311.77, of which explosives cost $19,300, and mercury, loss for season, 23 flasks, $1,116.70.



FIRST BENCH, ADVANCING ALONG CHANNEL.



JAPANESE BLASTING THE FALLEN BANK.
CARIBOO HYDRAULIC MINING CO.

Receipts for Season.

Gold product	$138,520.00
Profit on lumber	255.94
" boarding house	1,966.12
" stores	3,429.40
" blacksmith shop	370.55
Total receipts	$144,542.01
Total net receipts	53,230.24

Note.—The above information was kindly submitted by Mr. Hobson, but as the report was then in the hands of the printer, a more detailed and interesting account could not be given.

Golden River Quesnelle Mining Co., Ltd.

This company, formed in England with a capital of £350,000, £80,000 paid up; General Manager, Major Dupont, Victoria; Engineer, Jos. Hunter, M.P.P.; Mining Engineer, Joseph McGillivray, and Superintendent, J. J. Nickson, has secured the right to mine the South Fork of the Quesnelle River from where it flows out of Quesnelle Lake to where it joins the North Fork, or for seven miles of channel. In the past a large amount of gold has been taken from the bars and bottom of this river, and as it was impossible to lay bare by wing-dams only a small portion of this river-bed, it is believed that a large amount of gold can be won if the river can be checked and dammed up as long as possible, by throwing it back into the lake by means of a strong barrier at the outlet of the lake. Hence this bold undertaking.

Rich bars were found along this stretch of river, which flows in a strong stream of 12,000 cubic feet per second in low water and 24,000 in high water, in a succession of rapids or steep rifles, between steep banks and through canyon-like gorges. As this river has evidently cut across the Cariboo channel at Dancing Bill Gulch, and concentrated a large amount of material from here, and also may be now, below the dam, traversing the same channel or crossing it again, the gold in the present river has been robbed from the ancient water-course and scattered along, some of it being quite coarse.

After studying the various stages of the river flow, the engineers, Messrs. Hunter and Bell, have planned the dam and raceway, now being constructed at a cost of $250,000, at the foot of the lake where the river, as it leaves, is a little over 400 feet wide. The lakes above cover an area of over 150 square miles. During the summer months, or June to September, the high water season, the flow will be too great, hence mining, it is expected, will have to be done in early spring months and in the autumn before winter sets in, but to what extent and when the water can be thus confined, so as to have the river-bed dry and accessible to mining, will be more positively known on the completion of the dam. However, although this is a bold enterprise it is certainly well worthy of the attempt, and it is hoped that if the water can be held back long enough, rich returns will be the reward, as other undertakings of the same character will then follow. Of course below the Cariboo mine a large amount of tailings will accumulate in the lower three miles, a great part of which will be swept away by the rush of high water.

The dam.

(*a.*) Along the right hand bank has been cut out the raceway, leaving in the stream a very strong, well cribbed bulkhead or pier 400 feet long and 220 feet wide, 17 feet high above low water. The raceway, 400 feet long and 127 feet wide, has been piled and sheet-piled and very strongly cribbed and planked, and across this will be a series of 9 gates, each 12.4 feet wide in the clear, with a lift of 12 feet in ordinary and 19 feet in extreme flood water, each gate with flanged wheels running on railroad iron and strong lifting gear.

The dam, the race-way and gates being complete, is being thrown across the river on a curve, the segment of a circle with a radius of 115 feet, one end against the bulkhead, the other against the rocky left hand bank. The dam will be 93 feet wide at the base, the crest of the weir being 12 feet above low water, and 5 feet above the average high-water mark, and will consist of a strong cribbing 10 feet wide at the crest, sloping up stream, heavily rocked and with a planked slope for a width of 36 feet where will be a row of sheet piling 6 inches thick, and a slope to the toe of the dam paved with rock. When all complete, and this is expected this winter, the gates will be closed when it is possible to mine these river gravels;

and when it becomes impossible to hold the water any longer the opened gates are estimated to give ample discharge, not only to the regular flow of the river, but the accumulated waters in the lake which can be run off in 40 days.

Mining.

Mr. McGillivray has been collecting all possible data concerning the former diggings along the river, and has had a waggon road constructed along the right bank with many approaches to suitable points where lumber and other supplies may be assembled, so that as soon as the water is shut off mining operations can begin without a moment's delay. The exact method of mining will be determined by conditions found to prevail, but at first much of the ground will be run through sluice boxes put in at different points, sufficient water being allowed to run for such work. In the deeper portions of the gravels pumps may be required to keep out the water that will, most probably, seep in from the saturated river bottom.

Camp.

A commodious camp has been built above the site of the dam, where also is a steam saw-mill to cut the logs from fine timber limits along the lower reaches of Quesnelle Lake. It is expected that everything will be completed at the dam this winter when water is lowest, and in the coming spring mining will begin unless the weather is so favourable that work may be attempted before then.

The work at the dam was being done in an excellent manner, and every precaution apparently was being taken to make the work strong, water-proof and permanent, and the project to choke back this river, to bare and mine its bed, will be watched with much interest.

CONSOLIDATED VICTORIA HYDRAULIC MINING COMPANY.

This Company, for which Mr. Thos. S. Holt, Montreal, is President, owns a number of mining leases at different points, and a splendid water-right in Spanish Lake, but although a considerable amount has been so far expended in exploring these different leases not much has yet been discovered, except during the past season, when Mr. D. T. Hughes, an engineer of long experience in California, prospecting the company's leases along Rose's Gulch, that lies a short distance north of the Cariboo mine but on the other side of the South Fork, uncovered an old channel with a deposit of gold-bearing gravel.

At the time of visit, a considerable clearing had been made, and a face was being washed off with a 2-inch nozzle, and already both rims of this channel had been found at a point half a mile up the gulch from the main river. The channel appeared to be about 150 feet wide, and was at a considerable elevation above the bed-rock in the Cariboo mine, the gravel prospected well enough to be very profitable, if further development proves up a large body. Rose's Gulch has apparently cut across a bend in this channel, as along the south side test pits again disclose gravel, while the new waggon road to the dam at Quesnelle Lake, is said to have laid bare an excellent cross section along the right bank of the South Fork. A large amount of gold is said to have been taken from this gulch by both whites and Chinese, and higher up on the north bank of the gulch a small bed of gravel has been washed in a small way, coarse gold being found lying next to a peculiar deposit of "cement" or boulder clay. This discovery is of great interest, and during the coming season will be further opened up and explored, as a large amount of water can be brought from Spanish Lake in a ditch 12 to 13 miles in length, while the dumping facilities are excellent. The company at this point has acquired, or 3 miles from Quesnelle Forks, 4 leases and bonded the adjoining or Bain leases, by means of which a fair water supply can be secured for further prospecting.

On the left bank of the South Fork the company owns several leases immediately northwest of the Cariboo Mine, on which in the past considerable, but unsuccessful, work has been done, the Cariboo Channel having been thought to pass here. Work has also been done, but with poor results, on the lease on the north bank of the North Fork, below the mouth of Spanish Creek, to which water was brought from Spanish Lake in about 6 miles of ditching and a considerable length of pipe-line. Prospecting has also been done, but with no results as yet, on leases on Poquette Creek, near where it flows into Quesnelle Lake. During the coming year it is expected that all work will be concentrated at this discovery in Rose's Gulch, where another clue will be afforded to the as yet little understood buried river systems.

MONTREAL HYDRAULIC MINING COMPANY.

This company having secured 16 leases or 5 miles of ground east of Beattie Creek, on south bank of the main river of the Quesnelle, 16 miles west from the Cariboo Mine, considerable work has been done, but none during the past year, in exploring a gravel deposit believed to be in a channel or part of the ancient river system. There is here a large amount of gravel, auriferous, and a tunnel 1,000 feet long has been driven in gravel, but not on bed-rock, with cross-cuts 500 feet long to rock, thought to be the rims of the channel, here 500 feet apart, this supposed channel running through a valley or low depression from 2,000 to 3,000 feet wide. Also several shafts, 10 to 60 feet deep, have been sunk through surface dirt or alluvium to the gravel, which is said to be fine with some boulders, with, as far as prospected, low but pay-values in gold.

For hydraulicing, water-rights have been secured on Beattie Creek, across which, where it runs out of a low-lying valley occupied by a series of meadows and lakes, and descends through a steep and narrow valley, a dam 55 feet high, 250 feet long on top, and 40 feet at the bottom, could be constructed, and the water carried from this reservoir through 10¾ miles of ditch (or 8¼ miles by tunnelling 1,500 feet) and 4,000 feet of pipe-line across Beaver Valley to the river, where there would be a fall of 300 feet from the pressure-box to bed-rock. For dumping the sluices can discharge into the Quesnelle River with a clean drop of 100 feet. The present management is endeavoring to form a company with sufficient capital to more thoroughly exploit and test this ground and, if favourable, to put in the water-courses and open it up for mining. President, F. C. Innes, Vancouver; Manager, Thos. Drummond, Quesnelle Forks.

Boring Operations.

Immediately south-east of the Cariboo Mine, boring operations for Mr. Thos. Mill have been in progress during the past autumn in search of the continuation of this channel to the south-east, but, although a wide cross-section had been made, no channel was discovered as far as reported to date. Under direction of Mr. Hermann, Vancouver, the holes were being drilled to bed-rock with a very complete portable boring rig made by the American Well Works Company, Aurora, Ill.

Moorehead Creek Gravels.

As an example of the gravel deposits lying yet untouched, mention may be made of the above. Near the mouth of the Moorehead Creek, six miles below Quesnelle Forks, is the almost irrefutable evidence of the existence of a very large deposit of gravel, auriferous, in an old river channel.

At about three-fourths of a mile back from the Quesnelle River the gently sloping ground rises into the steeper line of hills, but here in the depression, down through which Moorehead Creek has cut a narrow gulch, is found a deposit of gold-bearing stratified gravel, gravelly clay and "slum" or sandy clay alluvium, at least 2,000 feet wide and 400 to 500 feet high above the present available sluice-grade, and probably 100 to 150 feet below. Moorehead Creek has cut part of its way through bed-rock, but the lower part has cut down through this gravel deposit not far from the western rim, and then into the rim itself to a depth of 0 to 200 or more feet, leaving benches of gravel remaining on this western rim-rock, while in the creek itself, where it has cut through this deposit, valuable gold diggings were found and worked, and in places re-worked, by the Chinese, which gold evidently had accumulated from the ancient gravel deposit on its erosion by the modern creek.

This channel now presents a quickly sloping face of gravel, silt and sand to the Quesnelle River, and has evidently extended up through the valley in which lie Little and Long Lakes, and entered or crossed the Cariboo Channel in Black Jack Gulch, where it turned and, probably running along the westerly bank, crossed what is now the valley of the South Fork. Beside this channel, there are strong evidences that other channels exist, probably tributary to the main one, bearing gravels that also prospect favourably, such as the channel evidently running towards and through the country now occupied by Moorehead Lake.

Nearly all the ground along the supposed courses of these old rivers has been located, and on the "Marpole" and "Eureka" claims, where Moorehead Creek cuts into this deposit, are two tunnels, one 120 feet, the other 160 feet long, driven in gravel from the rim-rock, which dips down and away from the creek. In both the gravel is rather coarse with, so far, few large boulders, and by panning tests, this material runs from five to fifty cents per cubic yard in gold, seldom a pan failing to yield at least one colour.

Water can be got from Moorehead Lake by storing it in Little Lake, which can be made a good reservoir by putting in a short dam, from which a ditch four or five miles long will deliver water under a 500-foot head. For a dump into the Quesnelle, the sluice boxes will necessarily have a low grade, or not more than three inches per twelve feet, and the lower part of the deposit below the creek level will have to be worked out by hydraulic elevators or drift mining, if the gravel should prove rich enough.

MOOREHEAD WATER-SHED.

During the past season Mr. Warner has been making a survey of the Moorehead watershed, more especially of the contour line to which the lake of this name will rise if a 35-foot dam is put in at the outlet. It has been determined that about 500,000,000 cubic feet of water can be here stored, and it is estimated that a large body can be impounded during the wet season, as at times 20,000 miner's inches per day may flow, or 30,000 cubic feet per minute, while for weeks the daily discharge is from 10,000 to 12,000 inches. A ditch will be built during the coming year to the Cariboo mine, eleven miles, and if there is sufficient water the ditch may be made large enough to carry water to Little Lake, on its way, where a reservoir may be formed if the above properties are opened up.

MAUDE HYDRAULIC MINING CO.

On Four-Mile Creek, one and a half miles up from its junction with the main Quesnelle River, four miles below the Forks, has been exposed in the ravine cut by it, a gravel deposit of great width belonging to an ancient channel believed to run, for some distance anyway, along the north of the Quesnelle. These leases are reported bonded to the Yukon, Cariboo, British Columbia Gold Mining Co. of New York, but were not examined, as the scanty exploratory workings were said to be buried by the slide material on the side of the gulch, which also concealed the gravel here cut through.

FISHBACK HYDRAULIC MINING CO.

Along the north bank of the North Fork, four miles east of the forks, is a series of leases at one time known by the above title, covering a large and thick deposit of gravel exposed here along the river. Some small test holes have been made and gold discovered, but practically very little has yet been done to thoroughly explore and prove up this property. For water for hydraulicing, water-rights have been secured on Duck Creek, from which a ditch ten miles long, tapping several smaller streams along its course, may furnish an ample amount.

OTHER LEASES.

Many other leases have been taken up, but so far little or no development work has been done to prove the amount or probable value of the gravel, work that is so desirable and important before any mining operations can be thought of, or even the proper flotation of companies, for upon the successful issue of work now in progress on other properties already described, many such leases are waiting.

HORSEFLY HYDRAULIC MINING COMPANY.

A very interesting mining problem and entirely different conditions have been developed in the gravel deposit in which this company has been working for three or four years, different in that the bed of this channel has so far been found to be dipping at a very flat angle, and that the entire gravel bank has become a hard cemented mass.

This company, with a capital of $250,000 in $10 shares, General Manager Jno. B. Hobson, now controls 19 mining leases, or 2,100 acres on the west of Horsefly River, five miles south of the Quesnelle Lake.

Formation. This gravel deposit lies on a rock series of the Miocene Period (Dr. Dawson), consisting of a well bedded or stratified formation of partly indurated shaley clays, sandy clays, very soft sandstone and shales, of which none of the members have been hardened into firm, compact rock as the overburden has evidently never been great. Fossil remains, such as fishes, shells, leaves of plants, etc., have been found in some of the strata. In the pit, now seven to eight acres in extent, this formation is seen to have been, before the deposition of the gravel, very much crumpled, twisted and faulted by some lateral pressure, the source of which may be found to have been caused by the effusion of volcanic matter, of which a chain of knolls one mile to the north and north east is said to exist. Faulting is in evidence, and later disruption has extended even into the gravel bank, where a down-throw of some distance is plainly seen in the pit, while crevices filled with fine quartz sand extend for long distances through the bank.

The chief component of the bed rock is clay, which underlying the gravel, is very soft and easily worked out with the pick. This rock shows in few places along the river bank and occurs also at Harper's Bar.

Gravel deposit.

Rich gravel bars were found in the Horsefly River immediately opposite where the present workings are and up on the river bank, about 100 feet above the river bed. This gravel deposit was discovered and mined in a desultory, small, but profitable manner for several years by McCallum, who had a small ditch running down from Rat Lake. On the purchase of this property, Mr. Hobson had a tunnel started near these old works and run in 500 feet in gravel along the channel ground that always prospected well, and showed no signs of cementing but made excellent hydraulicing gravel.

On completion of the water system development began, and as the bank was worked back it proved to be gravel nearly to grass-roots, while the bed-rock sloped gently southerly, away from the river bank for 400 feet, where the inclination increased to about 12 degrees, which slope has since been maintained in the underground works. Hence, along the river-bank only a narrow edge of this ground had been exposed above this rim, and as the deposit gradually sloped down the face of the work receded from the rim, and to the surface gradually arose a vertical face of gravel 60 to 105 feet high, now standing in the pit (as see in the illustration).

The gravel consists of sand, pebbles, cobbles, and a comparatively small amount of boulders, and among the rock fragments can be found all classes of rock, volcanic, igneous and sedimentary, with many very rounded fragments of barren, milky-white quartz. All of this gravel deposit is auriferous from grass-roots to bed-rock, but the gold is very fine in the upper portions, while the best values are found near the bed-rock, but not particularly at bed-rock, the gold being disseminated through the mass, especially in the lowest stratum, or "blue gravel," upon the values in which the future of this mine now depends. More or less gold had made its way into the shaley bed-rock.

At first this deposit worked out well with the monitors, the gravel breaking up easily, but as the face advanced the gravel began to get harder, and a band of cement from 2 to 10 feet came in, the cementing material being lime and in places strontianite.

As the amount of cement increased and the monitors made but little or no impression upon this material, powder-blasts were put in and very heavy charges of black powder let off, breaking down many thousand cubic yards of bank, which, lower down, proved so tenacious that even then hydraulicing would not avail, as the water would not disintegrate the masses already shattered by "bull-dozing," but swept it with most of the contained gold values out to the dump. After a long, persistent struggle during the season of 1896, it was seen that this method of mining had to be abandoned, and exploratory work was begun to learn whether any of this cement would pay to mine and crush in stamp-mills.

The "blue gravel" is 2 to 8 feet thick, according to the lie of the bed-rock, and is overlaid by a band of nearly barren and very hard cement 6 to 10 feet thick, and to work this "blue gravel," drift-mining has been experimentally begun with the erection of the 10-stamp mill. Three exploratory drifts were 120, 197 and 100 feet in length, in all of which was hard gold-bearing cement that could with difficulty be worked down with the pick, and into which holes for blasting were drilled with the long pointed steel bar. From these drifts and along the face of this bed-rock cemented gravel, as exposed for 700 to 800 feet in the pit, were taken six large samples for practical mill tests at San Francisco, of which the following results were obtained by submitting each sample to the regular stamp-mill process:—

Sample No. 1 from face of gravel in pit west of drift B, 2,854 lbs, yielded $3.79 per 2,000 lbs.

Sample No. 2 from drift B, 423 lbs, $5.71.
" No. 3 from face of gravel east of drift B, 2,222 lbs, yielded $5.16, per 2,000 lbs.
" No. 4 from first 60 feet of drift A, 967 lbs yielded $4.47 per 2,000 lbs.

These tests gave an average value per ton of $4.85 in gold.

Three other samples taken by Mr. Anderson along the exposed face of the blue gravel, on testing, gave as follows:—

Sample No. 1—865 lbs yielded $4.32 per 2,000 lbs.
" No. 2—851 lbs " $5.94 "
" No. 3—835 lbs " $6.42 "
Average yield $5.56 per ton of 2,000 lbs.

Constant panning tests also demonstrated good values in this blue gravel cement, so that the proposition to put in a 10-stamp mill to crush this material was assented to by the directors, and regular underground workings begun, as will be described.

MINING OPERATIONS.

Hydraulic Mining. (*a*) As the bed-rock dips away from the river, to provide the grade for sluices to the dump into the river, which high water scours out yearly, a cut was made through the rim-rock 500 feet into the bed-rock to a point where several bed-rock sluices were then cut to the faces of the bank, cuts that decreased in depth as the grade rose and as at the same time the rock sloped away in the opposite direction. Thus, about 8 acres, or an oblong pit 500 feet by 1,000, of gravel from 20 to 100 feet were worked out.

Water Supply. The water system brings water from Mussel Creek, a southern tributary of Horsefly River, by a ditch and pipe line 12.5 miles in length, with a capacity of 1,800 miner's inches, or 2,700 cubic feet per minute. Of this line there are two sections of pipe 30 inches in diameter, aggregating 8,300 feet, made as inverted syphons, to cross two wide depressions; also 600 feet of flume 3 by 5 feet. Water is delivered at the pit from the ditch line under a head of 168 feet, while from the Rat Lake reservoir under a head of 106 feet, giving adequate supply not only for mining, but for operating a stamp mill.

In the pit is a portable hydraulic plant of 22 and 18-inch steel pipe, and six No. 8 hydraulic giants, or monitors.

Sluices. From the pit to the dump ran a 3 x 5 feet sluice, 625 feet long, lined with wooden blocks in part, and horizontal iron riffles, with 30 feet of a dump into the river.

Drift Mining. (*b*) A main tunnel has been started at the head of these sluices, or 215 feet from the face of the gravel bank, and run on a grade of nearly .5%, through bed-rock to 400 feet where gravel first appeared in the roof, and at the face (515 feet, Sept. 1st), the bed-rock, which is somewhat undulating, was one foot above the floor, and still dropping. This tunnel is being run at right angles to the apparent course of the stream, and hence will explore this bed-rock if it does not dip too much away or fall below the tunnel level. In this tunnel, upraises had been made to the gravel, and drifts started along it both ways, and this stratum, 2 to 8 feet deep, was being blocked out and mined, as well as a few inches of bed-rock, all boulders or large stones being picked up and piled back to form pillars in the stopes. The gravel prospected well as work advanced, but the gold seemed to be in "runs" through the mass, as was to be expected, and in the first mill run the returns of about 1,200 tons of gravel, dirt, etc., of about $1.00 per ton could not be taken as an index of the value of the gravel, while a later clean-up is reported to have yielded much better results.

Stamp-Mill. This tentative plant comprises (*a*) two self-feeders; (*b*) two batteries of five stamps, each 850 lbs., drop 7 inches, 90 to 100 per minute, depth of discharge 4 inches; $\frac{3}{16}$ (changing to $\frac{1}{4}$) inch punched steel screens; dies forged steel 7 inches high; mercury, one to one and a half ounces per mortar per hour; *capacity*, 11 to 12 tons per 10 stamps per 24 hours.

Power. (*c*) A 16-inch steel pipe brings water with a head of 106 feet to a 6-foot Pelton, but for winter a 35-horse power engine, 10 x 12 inches, will be used.

(*d*) Gold-saving appliances consist of (1) a riffle-box 4 x 8 feet in front of each mortar, with iron-shod wooden riffles 1 inch wide, 3 inches deep, parallel to lip of mortar, the whole enclosed in locked casings; (2) sluices or riffle-boxes 110 feet long to dump, 2 feet wide, 7 inches deep to riffles, which consist of longitudinal wooden strips 3 inches deep, shod with iron 1 inch wide, and one-half inch apart, the lower 16 feet of the sluices being lined with, instead of riffles, 2-inch planks, in which are bored 1-inch holes, ½ inch deep and 1 inch apart in alternate rows. At the end of this line of sluices was a small trap, but no gold had reached this far, and only pyrites were being caught.

In the operation of this mill, two Japs per shift on the feed floor broke up the cement, picked out stones, and fed remainder to the feed-hopper, and for 24 hours in crushing 110 tons of material, the following labour was required :—

Foreman,	1 @	$5.00	$ 5.00
Batterymen,	2 "	2.50	5.00
Japs,	6 "	1.75	10.50
			$20.50

Other buildings comprise saw-mill, offices, store-houses, bunk and eating houses, stables, etc.

Timber has to be hauled 5 miles from a good source of supply.

Labour.

8 miners	$ 3.50	per 10 hours.
2 carpenters	3.50	"
1 blacksmith	3.50	"
2 millmen	2.50	"
2 ditchmen	70.00	per month.
18 Japs	1.75	" 10 hours.

This force was augmented after September 1st, by about 20 Japs from the "Cariboo" mine.

Values in Gravel.

During the seasons of 1894-5-6, before hydraulic mining was abandoned, $92,426 were recovered from 750,000 cubic yards of gravel and extremely hard cement, or 12.3 cents per cubic yard.

Returns for 1897.

The following interesting table has been submitted just as the Report was going to press. It has been found that with the 10-stamp mill, 135 tons of cemented gravel can be crushed per 24 hours, and that the total cost of mining and milling will not exceed $1.40 per ton.

In the following table it will be seen that the grade of the gravel shows a steady improvement in value. Work during the winter has been suspended, to be resumed in the early spring :—

Stamp-Mill Report.

Dates.	Mill run hours.	No. Stamps.	Tons of gravel crushed.	Gold Recovered.	Yield per ton.
July 10th to August 3rd	426	10	1,100	$1,093.07	$0.99
August 3rd to September 5th	488	10	1,660	1,890.78	1.13
September 5th to October 3rd	538	10	1,987	2,488.12	1.25
October 3rd to October 10th	133	10	629	1,120.00	1.78

Ward's Lease or Horsefly Gold Mining Co.

This company, capital stock $1,000,000 in $10 shares; Manager, R. T. Ward, Horsefly P. O., owns the lease of ground one mile by one-half mile along the Horsefly River at Harper's Bar, 5 miles south of the workings of the Horsefly Hydraulic Mining Co.

The Horsefly River flows through a rather swampy, flat-lying valley for several miles, but gold was discovered on Harper's Bar, from which considerable gold was taken by both whites and Chinamen. At this point the bed-rock is the same as at the Horsefly mine, and in the present river the gold has been found in a yellow gravel, but on mining, damming, and sinking shafts, a rich blue quartz gravel was found lying on a steeply-pitching rim-rock, and on sinking more shafts, such as the Riskie, 136 feet, Veith and Borland, 70 feet, good values were nearly always found along and near this rim-rock that dipped at an angle of 30° to 35°. Further work, as in the "China Pit" and other shafts and drives, the pitch of the rim-rock and the large deposit of hard blue gravel, made very patent the fact that here the Horsefly River has cut across a deep, wide, ancient channel and enriched the latter bars by gold washed out of the blue gravels and especially that near the rim-rock.

Knowing these facts, Senator Campbell, on the adjoining property described below, has sunk a 250-foot shaft, further proving the existence of this channel.

To work this gravel at Harper's Bar, an hydraulic elevator plant has been installed, as nearly all the ground that could be laid bare by wing-damming, etc., had been worked, and two pits have been begun, one on either side of Horsefly River, but lack of water prevented the final clean-up of the sluice boxes, the pits at once filling up when the elevators ceased working. This mining is not only removing the modern gravel, but is laying bare the rim rock of shaly clay rock and blue gravel, of which a considerable amount can be thus handled if sufficient water is procurable and the sluices are run out to give a good dump to the tailings.

Water.

By agreement with the Horsefly Hydraulic Co., this company secures all surplusage of water in Mussel Creek above what the former company requires and can carry off in its system of ditching, but this arrangement has already led to trouble and legal complications.

(*a.*) A ditch 5 miles long, 4 feet wide on bottom, 3 feet deep, and grade 6.4 feet per mile, has been dug from the dam on Mussel Creek, then

(*b.*) A pipe line 9,500 feet long has been laid to the mine, of which 7,000 feet are 30 inches in diameter, of No. 12 steel plate, reducing to 26 inches in diameter, while below the Y, two lines, each 22 inches in diameter, are contracted to 15 inch pipe for the elevators and 11-inch for the monitors, so that there are about 13,000 feet of pipe line. The total head of water at the elevators is 305 feet, with a pressure of 105 lbs. per square inch.

Hydraulic Elevators.

(*a.*) In "China Pit," on left hand of the river, the elevator lifts the gravel, water, etc., 40 feet into the sluices, and with a 4-inch nozzle 12-inch throat and 18-inch discharge pipe, elevates about 1,000 cubic yards of gravel per 24 hours, using a No. 3 monitor with a 3-inch nozzle.

(*b.*) In the other pit the elevator, with a 5-inch nozzle, a 16-inch throat, and 22-inch discharge pipe, is calculated to raise 33 feet, 1,500 cubic yards of gravel, using a No. 3 monitor with 4-inch nozzle.

Sluices.

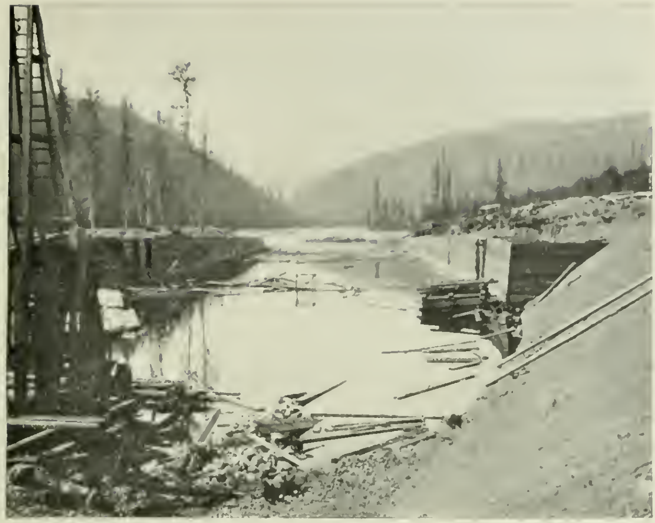
(*b.*) In the pits at the foot of the elevators are short sluice boxes 20 to 24 inches wide, and at the head the discharge sluices are 34 and 48 inches wide, but comparatively short length, so that the tailings are being dumped close to the pit.

During the last season mining operations began April 13th, and a full supply of the water lasted to August 20th, but mining could not be carried on all that time, for in the season of highest water, for 4 to 6 weeks in June and July, when water is most abundant for mining purposes, the workings are flooded, except the "China Pit," which is flooded only in excessively high water. This pipe-line will not carry enough water to keep both elevators working at the same time, the large one requiring the maximum supply for efficient work, the smaller one in "China Pit" being used when water begins to slacken. Hence when water is in greatest supply, flood water greatly prevents its use. On the stoppage of the water some of the sluice boxes were cleaned up, but a general clean up was not possible before the pits filled, for although some gold is lifted with the gravel the most of it is caught in the boxes at the foot.

Trouble and delay were felt by the wearing out of castings in the elevators. During another season if a continuous supply of water can be got, a much greater amount of gravel can be mined, the pits got into better shape, and some definite results obtained, and as the rich ground gets below the influence of these appliances, drift mining will have to be resorted to if the ground proves to be rich enough to pay for this system of mining.

Timber is scarce close by and has to be hauled two or three miles. While working, 16 men were employed at $1.50 to $2.50 per day and board, pipe-men getting $2.00 per day and board, and the necessary rubber boots.

An electric lighting plant lights the workings with seven arc lights, a pipe running from the main line to a Pelton wheel, that supplies power for the dynamo.



VIEW OF RACE WAY AND DOWN THE RIVER.

SITE OF DAM WHERE RIVER LEAVES THE LAKE

GOLDEN RIVER, QUESNELLE, LIMITED, CARIBOO, B. C

MIOCENE GRAVEL MINING COMPANY, LIMITED,

This company—capitalized at $300,000, in $10 shares: President, G. Drysdale, Secretary, F. J. Coltardt, Vancouver; Manager, R. H. Campbell, Horsefly P. O.—has secured twelve leases, or 960 acres, and applied for two more, or 160 acres, along this channel crossed by the Horsefly River at Harper's Bar or Ward's Mine, and thought to extend to the north west, down through Beaver Lake Valley, where are found outcrops of gravel quite similar to that found here.

Senator Campbell, on studying the conditions at Harper's Bar, and recognizing the fact that the shafts sunk here and all the other workings betrayed the existence of a large ancient and gold-bearing channel running east and west through this flat-lying country, having secured the ground lying on the west of the Harper lease, began the sinking of a shaft 4 by 8 feet, to exploit this channel. As the values are thought to be along the rim-rock and bottom of the channel, it was hoped that this shaft would reach the bottom of the channel, but at a depth of 250 feet the shaft was still in the blue, hard gravel, showing an unexpectedly great depth. For the first 65, feet the shaft passed through hard boulder clay that near by forms one of the banks of the Horsefly, and then into the great deposit of gravel, in which is a large amount of quartz pebbles and small boulders or cobbles, perfectly water-worn, and a small amount of very fine gold.

Shaft. At 250 feet, a run of fine sand checked sinking, as the pumps and hoisting plant were hardly adequate, so great a depth not having been anticipated; so sinking was stopped until heavier pumps could be installed, although the flow of water is small, or about 35 gallons per minute. Instead, after putting in a pump station at 180 feet, a cross-cut was started and run to what may be the rim-rock. If, on reaching bed-rock, gravel is found rich enough to pay for drift-mining, having ascertained the exact position of the gutter or lowest point of the channel, a working shaft can be sunk with proper hoists and pumps for the water, that promises to be light in flow, as the boulder-clay keeps out all surface water, and it is possible, in the Beaver Lake Valley, to run a long tunnel to drain and exploit a long stretch of this old river course, after thoroughly prospecting with drilling machines, which might have been used to great advantage before the present work was undertaken. There are no signs of cement-gravel so far to be seen.

The results of this prospecting will be of very great importance, for, if favourable, the course of this channel, or system of channels, will be extensively explored, and other mining companies will have no trouble in raising capital to work on a large scale, and work on this property as well as on the Ward lease will be closely watched. At time of visit 15 men were employed, and at the shaft, which was well timbered by cribbing up solid with sawn timber and with square setts and spiling below the pump station, there were a 25 h. p. hoist (Park & Lacey), good boiler, sinking pump and small saw-mill, but this prospecting was being done as economically as possible. Much heavier hoisting and pumping machinery is now en route to the mine.

OTHER LEASES.

Many leases have been taken out along the supposed channel courses, the holders of many of which are awaiting for developments; but to the east of Ward's claim Mr. Leask has secured several leases, on which shafts have been sunk in the same kind of gravel, one 60 feet deep, but not to bed-rock on account of water and no pumping facilities, showing the continuation in this direction of this channel through a low-lying depression.

GOLDEN PROVINCE MINES CO., LTD.

Drift Mine.

A company with a capital stock of £125,000 has been formed in England by Mr. C. F. Law, of Vancouver, to prospect a very interesting property on Baker Creek, three miles west of the Fraser River at Quesnellemouth where, on the face of a bluff, a deposit of wash gravel is clearly seen to be overlaid by a basaltic overflow.

A block of land 2½ miles square has been secured, and the following work is being done by Mr. Law:—

The top of this lava-capped bluff is 1,000 feet above the Fraser or 825 feet above Baker Creek, and a sheet 50 to 60 feet thick of lava very spheroidal in structure in the lower part, lies upon a narrow band of sand, below which is a great thickness of fine gravel and sand with many quartz pebbles and cobbles. This face or section is normal to the direction of Baker Creek and parallel with the Fraser and, it is now believed, across the old river channel thought to be here.

Just below the steep part of this bluff, a shaft was sunk 260 feet through this gravel to the slaty rim-rock, and there a drift was run north 220 feet through a more or less cemented gravel that required shooting to the other rim-rock which, on both sides of this apparent channel, is steep and smooth. In the centre of this cross-cut a blind shaft was sunk 60 feet until water became too strong, but in the bottom there was taken out a reddish gravel and slaty detritus, fallen in from the old river banks, or fragments of slate, shales and blue quartzites, at least this was the kind of material pointed out to the writer, who was unable to get into these workings. From this material in the shaft, Mr. Law states, was washed fine gold and, with the data obtained in this working, he determined to begin at Baker Creek a tunnel to be run straight for this shaft, to determine whether the bottom or gutter of this channel is *above* or *below* this tunnel level.

It is estimated that it is above, so that the gravel, if such proves sufficiently rich in gold, can easily be worked down into sluices in this tunnel, but the gutter may be below, and this will only be determined when this tunnel is in far enough to strike, or else pass under this channel. If it passes under the channel, the prospecting and mining of such a gravel deposit will be comparatively simple, but if the gutter is below this tunnel-level, it will then become a difficult matter to handle this material.

However, this is a very important undertaking, and its progress is being watched with great interest by many.

The tunnel was in 425 feet (September 20th), with 1,100 feet still to run to be under the blind shaft where it will be 170 (?) feet below the shaft. The tunnel is 6 by 7 feet with a grade of 2 per cent. for fall for the sluice boxes that, it is expected, will be installed. In this tunnel, the slates are traversed by many small veins of white quartz, and at 100 feet, a band of quartzite material carrying a little sulphides was passed through.

Compressor. A five-drill air compressor, a 30 h. p. boiler and two drills had been ordered from Joshua Hendy, San Francisco, and is now in place at the mine, and with this plant the work will be greatly expedited. Good spruce and fir timber can be got three miles distant.

Mr. M. S. Clark was in charge of the work with 12 men.

The channel appears to have a trend at this point of north-east by south-west, and towards the Fraser, has been much eroded and buried again under heavy wash, but beds of quartz gravel are seen along the trail, and near the Fraser, within the direction of this course, bars were washed for many years.

(B.)—BARKERVILLE DISTRICT.

THE CARIBOO GOLD MINING COMPANY, LIMITED.

Hydraulic Elevators.

Capital stock, £100,000. Secretary, W. B. Brough, London, England. Manager, Mr. James Champion.

This company has secured five mining leases and five patented claims on or along Williams Creek, and over $250,000 has already been spent in preparing this property for mining. Having secured the rights to the best of Williams Creek where it enters the wide valley, opposite the former site of Marysville, and for a considerable distance up the stream towards Barkerville, it is proposed to work by means of hydraulic elevators of large capacity, all the ground, 60 to 70 feet deep, down to bed-rock, where in early days so much gold was got by drifting along bed-rock, but leaving, it is believed, a large amount of gravel above, which (while not profitable then to work with the very high rate of wages) is thought by the company to now offer with this latest method of handling gravels, a promise of good returns.

Success will depend, to a very great extent, upon the supply of water, of which a large amount will be demanded.

Gravel.

In early days nearly all of the gravel lying on bed rock in Williams Creek, from the Ballarat Claim up to the "canyon," was mined out, and in this mining a large amount of timbering was used which remains there to-day. Above this was gold-bearing gravel, clay and slum, and since then from 10 to 15 feet of gravel have been hydrauliced into this stream from the benches and gulches above, so that in this undertaking, it is proposed to work out all this material down to bed-rock by raising it by means of hydraulic elevators into the high sluices, by means of which all this material may be swept away to the dumping ground, which otherwise it would be impossible to move. In the preparatory work all gravel that has to be handled is run through sluices to augment the prospecting done before permanent work was begun. The writer has no information for report as to the values contained in this gravel.

Hydraulic elevators.

Work is being started on the old end of the Ballarat claim where there will be two Campbell Hydraulic Elevators (to be installed this winter) side by side, made at the bottom of heavy castings, well welded wrought-iron piping leading up to the sluices. In the bottom will be the inlet nozzle for the water under a head of nearly 800 feet, that will direct this powerful stream of water up the pipe in the lower side of which is an opening or gate into which the gravel is run by other streams, and then elevated in the sluices by the force of the elevating jet from the nozzle. In this pipe the diameter is contracted to 12 inches at the throat, but above that the pipe is 18 inches in diameter. These elevators are set at an inclination of 30 degrees from the vertical, and it is estimated that with the head of water, 1,200 to 1,500 cubic yards of gravel, dirt, etc., can be raised per 24 hours in each elevator with 600 miner's inches or 900 cubic feet of water per minute.

In beginning this work a shaft 5 feet by 8 feet 4 inches has been sunk to bed-rock through 68 feet of gravel, etc., in which will be placed the elevators; then another inclined shaft has been sunk at right angles to the first one, down which pass the water-pipes to the bottom of the elevators. When all connections are made and the forceful streams of water turned on in the elevators, work will be begun by working the material about the top of the elevator shaft down to the gate of the elevator, to be thence raised and discharged into the sluices. (*See* illustrations.)

The vertical lift from bed-rock to the sluices will be 88 feet. Thus a pit will gradually be worked out about the elevators and down to bed-rock by using monitors with nozzles 3 to 4 inches in diameter to wash the material towards the gate in the elevators, and as this pit enlarges, the sluices can be extended and the elevators moved farther up the stream. Also small sluice boxes will then be placed on bed-rock and the larger percentage of the gold should be caught here as the gravel rushes toward the elevators, and timbers, boulders, etc., can be piled up on the washed bed-rock.

Sluices.

On high trestles, 20 feet above the surface, 800 feet long, will be the sluices, in two compartments, 4 x 4 feet, paved with wooden riffle blocks; grade, 3 inches to 12 feet. This work, by means of which a large amount of material is afforded an artificial dump at a good distance from the workings, was just completed in the month of October. The top of the pipe of the elevator is let into the floor of the sluice, and then a very strongly constructed hood will be built over this discharge, as, with this head of water, the gravel, boulders, etc., will be discharged with terrific force from the pipe.

Drainage Tunnel.

Starting at Little Valley Creek, a drainage tunnel had been run 2,750 feet, with 130 feet still to go to reach the bottom of the elevator shaft, and by this tunnel all the surface water down to bed-rock will be drained out of the workings, which otherwise would be flooded. All gravel and dirt taken out in this work was being run through sluice-boxes to catch any gold present, with reported excellent results.

Flume.

To carry the waters of Williams Creek past these operations, a small dam was built across the creek 1,400 feet above the elevator shaft. A flume, 2,200 feet long, 6 x 14 feet, in two compartments, paved with wooden blocks, discharges near the lower end of the sluices, as shown in the illustration.

Pipe-line.

From pressure-box at the ditch, two lines of piping, 5,000 feet each, will carry the water to the foot of the elevator under a vertical head of 792 feet. The welded wrought-iron piping, imported from England, decreases in diameter from 36 inches at the top to 18 inches at the bottom, the lower pipes being of one-quarter inch metal.

Ditches. (*a.*) Fourteen miles of ditch have been completed to carry water from all the lakes and streams on the mountain sides tributary to Williams Creek, and reservoirs were being made on the mountains to impound all water that could be got. This ditch, 9 feet wide on the top, 4 feet on the bottom, 2½ feet deep, with a grade of 9.6 feet per mile, is expected to carry 2,000 inches of water.

(*b.*) A second but short ditch has been built to carry water from Williams Creek to supply the monitors.

Water Supply. This company has secured practically all the water supply available, and for a part of the season, when the snows are melting rapidly on the hills, there will be for five to six weeks an abundant amount. After that the supply rapidly decreases, and the storage reservoirs will be taxed to maintain the large quantity required by these elevators, and only one elevator it is estimated may be then run six or seven weeks.

During the coming season, operations will be begun with both elevators, when the real conditions affecting this water supply will be learned, and it will be of greatest interest, as to make such an enterprise as this profitable, a large amount of dirt must be washed, and a large supply of water throughout the season must be obtainable. It is to be hoped that this company will meet with every success, for, should the proper conditions of pay gravel and sufficient water prevail, it will take many years to mine out the ground embraced within their territory, although it will take at least two seasons to get opened up to do maximum work.

Placer Mining. This company has secured some placer ground, and has been working in a small way the "Eye-opener" claim, immediately opposite Barkerville, with, it is reported, indifferent results.

Willow River Drift Mining.

Mr. Fred C. Laird has been engaged for several years on a very important work—the undertaking to reach and explore the gravels lying in the deep channel under the present Willow River—and after many difficulties and most discouraging accidents his work has now reached that point where he can determine whether gold in paying quantities exists in these low lying gravels. Should he meet with success, others will quickly follow his lead and explore other rivers and creek channels. Mr. Laird having secured five mining leases, or four miles along Willow River, sank seven holes to bed-rock with a Jetting machine across the valley of this river below where Mosquito Creek flows in, a creek from which a good deal of gold has been worked, and where every year two parties of men make good pay working while water lasts. Willow River for two or three miles above this flows through a wide valley of meadow land never prospected, and here flows in a fair size stream through a gently falling valley, with a fall of about 12 feet in 1,000.

In this cross-section the gutter was found at 102 feet, and fine gold was brought up by the machine in the gravel in each hole. A shaft was sunk here 50 feet, but the water was too much, so a tunnel was started 300 feet west of this line of holes and near the creek, and run south 620 feet to bed-rock, where a shaft 6 feet by 12 feet was raised 100 feet to the surface, and also sunk 110 feet, whence a drift was run out 485 feet to where gravel appeared in the roof. There had been some trouble before with water, as the pump was poor, but just at this juncture a fire destroyed the engine house, hoisting engine and head gear of the Cornish pump, and while a new plant and buildings were being put up, the workings filled up with water to the tunnel level.

At the time of visit the new plant was in working order and the drift was being cleared out when another delay was met with by a not serious break in the pump.

Plant. The plant now comprises a 50-h.p. boiler, a 65-h.p. engine for pump, and a 15-h.p. engine for hoisting. The pumps, made by Moran Bros., Seattle, are made after a rather new design, and were giving very good satisfaction. A 5-foot fly wheel, connected to engine by belting, is geared to two pairs of pump-rods of 2½-inch steam piping, each of which extends down the shaft to its plunger. Thus each pair of plungers of 8-inch diameter, 24-inch stroke, discharge alternately into the 6-inch water column, of which there are two up to the tunnel. Each pair can be thrown out of gear, and in sinking one pair can be kept at work while the other is being lowered. At time of visit only one pair, at 16 strokes per minute, was required to handle the water, but the pump may run up to 34 strokes, or a discharge of 1,300-1,400 gallons per minute for the lift of 110 feet.

No provision has yet been provided for handling the gravel when brought to the surface if mining operations are begun. If this exploratory work proves to be successful, other cross sections will be made and other shafts sunk along the river. Timber is good and abundant.

Since time of visit, on breaking into the gravel at the face of the 185-foot drift, the water has proved too much for the pumps, which have been drowned out, and as the Cornish pump is not available, new steam pumps of much greater capacity have been ordered.

SLOUGH CREEK GOLD MINING COMPANY.

Drift Mining.

On Slough Creek, or a creek between Lightning and Willow River, the above company is attempting to reach the bottom of the deep channel known to exist, by bore-holes, but progress has been greatly delayed by finding that the data secured in sinking these bore-holes were not correct in some important particulars, as (*a*) the depth to a thick stratum of boulder-clay was found to be 50 feet deeper than stated by the man who sank the first holes, and the long drainage tunnel was thus too high, and could not drain the ground above this clay through which it would then have been comparatively easy to sink a shaft to bed-rock ; (*b*) one bore-hole, instead of striking bed-rock, was found on drifting underground to have reached a bed of very large boulders or great masses of the slate country rock, some twenty feet long, hence the drainage tunnel to the rim rock had to be driven much further than was anticipated.

This company has acquired 5 leases or 5 miles along the valley of Slough Creek, ten miles from Barkerville, or five miles from Stanley, on Lightning Creek.

Slough Creek is a small stream meandering down through a wide level-bottomed valley, and along its southern tributaries, or Burns, Nelson and New Creek, a large amount of gold has been taken, especially from Nelson Creek, where the yield is supposed to have equalled $3,000,000. Also a bench of gravel extends along the south side of this valley, from which the Chinese yearly extract very good pay. This company began operations by sinking a series of holes with the Jetting machine, across the valley, just below where Nelson Creek flows into Slough Creek, here practically level for 1,800 feet across. The deepest point of bed-rock, or the gutter, was found to be at 287 feet from the surface, and near the centre of the channel. To the south, or towards Nelson Creek 260 feet, bed-rock was struck at 245 feet, and 250 further at only 15 feet apparently.

The thick bed of clay overlaid by a loose, sandy gravel or slum, and underlaid by bed-rock gravel, being stated to be nearly 40 feet from the surface, to drain all this water-soaked ground above the clay, a tunnel was driven 2,200 feet and then a shaft was sunk to strike the gutter. At a depth of 84 feet the clay had not been reached and, as the amount of water and slum coming in was more than the pumps could handle, this work was abandoned.

Starting from this drainage tunnel, a drive was run south for the rim-rock and, at the point indicated by the 15-foot bore hole, were found the large angular masses of rock mentioned above, so that Mr. Hopp, working in very bad, dangerous ground—which, however, he conquered by careful, patient work and good timbering—was compelled to drive 500 feet more to bed-rock, and now it is seen that to reach the gutter of this channel a shaft at least 320 feet deep and a drive of 1,000 feet along will have to be made in solid rock before these low-lying gravels can be reached and prospected to ascertain what values they may contain.

As on Willow River, this thick stratum of clay, if kept intact, should serve to keep out the surface water and save a large amount of pumping. Thus, since 1892, 3,500 feet of drift have been driven, and the plant now consists of two 35-h.p. boilers, one 16-h.p. hoisting engine, a four plunger pump made by Moran Bros., of Seattle (now loaned to Mr. Laird on Willow River).

At the time of writing, a drive is being run to prospect a bed of gravel at the mouth of Nelson Creek from which Chinamen, years ago, are said to have taken much gold.

This property has recently passed into the control of The Incorporated Gold Mines of British Columbia, Limited ; capital stock, £200,000, for which William Thompson will be engineer, and during the coming season work will be more vigorously pushed.

THE BRITISH COLUMBIA DEVELOPMENT ASSOCIATION.

Wm. Thompson, M. E., of London, England, has bought or bonded for this English company a number of mining leases on Williams Creek, Willow River and Slough Creek, which he is expected during the coming season to prospect by sinking, at different points, a series of holes to bed-rock, This work will be done with the Jetting machine already mentioned, and when a cross-section has been secured of a channel, a shaft and tunnel in rock can be driven to reach and explore the gravels in the channel

BIG VALLEY CREEK.

A company, of which Major C. T. Dupont, Victoria, is President, is prospecting a deep deposit of gravel on Big Valley Creek, a tributary of Willow River, 12 miles from Barkerville; but the workings were flooded, as the pumping plant was at that time inadequate to handle the water, and other pumps were being arranged for.

WAVERLEY HYDRAULIC MINING COMPANY.

This company—General Manager, Jno. Pomeroy, Barkerville—owning three-fourths of a mile along Grouse Creek, six miles east of Barkerville, began its first work here in 1867, by sinking a shaft and drifting; but this work not being profitable, in 1868 a drainage tunnel, 500 feet long, was begun in a canyon and driven through the slates and schists, and when the channel was entered (but above bed-rock), the large pit seen to-day was begun by washing the dirt out by the tunnel. Thus the pit, now 1,000 feet long, 200 feet wide on top, and 80 to 90 feet at the base, was advanced up this channel, but no values were got until recently, when a stratum of pay gravel, now 80 feet wide and 25 feet deep above the sluice-boxes, came in.

Water is got from Grouse Creek and carried in 1,500 feet of piping to a No. 2 monitor, under about 200-foot head, and runs for three months. The first season of profit was that of 1896, and this year expenses were paid, but a dividend was prevented by a large slide, to get rid of which, to clean up some of the last boxes in the sluice, there was not enough water remaining. This company now thinks that after many years of work the good ground is now entered, and one and a half miles of this channel yet remains to be mined.

NIP AND TUCK.

The Chinamen yearly clean up a few thousands from a bench of ground lying east of the "Black Jack" claim at Barkerville, and at several other places work on a small scale is carried on while the limited supply of water lasts.

NOTES ON DREDGING FOR GOLD.

BY JOHN W. GRAY.

Mining and Scientific Press, San Francisco, Nov. 13th, 1897.

"After great effort, numerous trials, many failures and some large losses, this system of gaining gold has been evolved from crude beginnings into a systematic and satisfactory method of mining. Dredging for gold is now attracting attention and bids fair to become an established form of mining for gold. In New Zealand, where more work of this nature has been done than elsewhere, the evolution of the industry has been the work of years. The rivers upon which dredging operations are carried on are swift flowing streams, subject to frequent floods, having a considerable depth of gravel, with boulders, and with runs of pay dirt interstratified. The conditions are, therefore, not the best for economical and successful work, and it is not surprising that many failures have occurred. The runs of gold are, however, often extensive and rich, and operations carried on upon such reaches have in a number of cases given satisfactory results.

"The improved form of dredge is a double pontoon, with ladder and chain bucket arrangement between. Screens separate the coarse from the fine material. Wide sluicing tables catch the gold, centrifugal pumps supply water, and the waste material is handled by elevators. The power is usually steam, although electricity is used in a few instances, where conditions are favourable. The dredges vary in size and capacity, but are now built of large size and great strength. Twenty thousand dollars is the cost of a large dredge with all the latest contrivances. Under favourable conditions, material has been handled without loss that only yielded a grain of gold to the cubic yard. The real cost, in actual continued working, is believed to be very much in excess of that figure where average conditions exist.

"According to the report of the Mines Department for 1896, the gold saving appliances of the dredges operating upon the Clutha River and tributary streams, were imperfect, and the work was considered remunerative only because of the richness of the ground worked. No information as to yield of gravel or cost of work is given, and secrecy is maintained by those operating dredges regarding yield and value of gravel, cost of work, and all the details of their operation. One dredge on the Clyde side of the Shotover, working to a depth of 20 feet below water level lifted forty tons per hour when operating. Six men were required to work day and night, and three tons of coal were consumed per day. According to the New Zealand Mining Record, eleven dredges, during the four weeks ending July 24th, 1897, secured $29,548, working expenses being about 21 per cent. of the total yield. This would give an average for the month of $2,686 for each dredge. Nothing is learned regarding value of operations, amount worked, or expense of working, save as percentage of total yield. This is an unsatisfactory and misleading way of reporting results of operations, and gives no information that is of value to those interested in such matters. According to the Government expert of the Mines Department, the dredges have, as a rule, been under the management of men with mechanical skill only. The gold, it was thought, would save itself if the dredges handled the material. Many of the failures are attributed to the fact that the men in charge were not familiar with or skilled in gold-saving operations, and it is believed that has been the prime cause of nearly all failures where the conditions for operating were favourable.

"So far in this country, with a few exceptions, dredging operations for gold have not been financially successful. From crude beginnings, however, the machines have been rapidly improved and perfected until now, in some localities, dredges believed to be the most complete yet constructed, are being put in operation, and results are promised, not yet attained, in the way of economical working and high percentage of saving. During the last few years, a a number of dredges have been operated in California, British Columbia, Idaho, Montana and Colorado, but with poor success. Very few proved themselves capable of paying their way. Some of the machines were faulty within themselves, others were entirely unable to cope with the swift currents and large boulders of the streams upon which they were operated. This latter is said to have notably proved the case with the dredges tried upon the Fraser and Quesnelle Rivers.

"Dredging operations upon Grasshopper Creek, near Bannock, Montana, are now carried on successfully upon a large scale. The Upper Sacramento River in this State, has a dredge doing profitable work, and in a small way, dredging is successful upon the Klamath. A dredge upon that river, composed of two flat boats with a large steel scoop between, is able to cut and hoist the gravel and soft bed-rock, and to handle boulders of from four to six tons weight. The dredge is run day and night, has a 25-horse-power engine, and requires three men for each shift. In gravel 10 to 25 feet deep, 400 cubic yards can be handled every twenty-four hours. Cost of dredge, $8,000.

"A large dredge of the chain-bucket variety is operating in northern Mexico, in a dry country, where there is little water. The actual capacities of these machines are 60, 100, and 150 yards per hour.

"Perhaps the most interesting dredge yet brought to the notice of the public is one lately built by the Risdon Iron Works, of San Francisco, and now operating upon the Yuba River, near Smartsville, Cal. It is of the elevator or chain-bucket type, 96 feet long, composed of two pontoons separated by a space 5 feet in width, in which is operated the ladder carrying the buckets. One man controls the dredge by means of a power winch with six drums. Four drums carry lines from the corners of the dredge to anchorage on shore—one a head line and one the ladder line. The machine is to dredge to a depth of 45 feet, and is said to have a gross capacity of 93 cubic yards per hour. The material discharges from the buckets into revolving and perforated screens. This segregates the large material, which is then conveyed away by the tailings elevator. Water (3,000 gallons per minute) is supplied to the revolving screens for washing and sluicing purposes by a centrifugal pump, and the fine stuff falls through the holes in the screen into a distributing box, from which it passes to a set of gold-saving tables, and thence to a flume. The tables are covered with cocoa matting and expanded metal. The top tumbler of bucket chain is operated by a vertical compound condensing engine indicating 35-horse-power, which also operates the pump. It is claimed for the dredge that for any ground not deeper than 60 feet below water level or more than 20 feet above, and which contains boulders of not more than one ton weight, the material can be handled at from 3 to 5 cents per cubic yard. If the capacity of the machine is given without deduction for water raised, imperfect filling and general delays, and the increase in the volume of the gravel when broken up in filling the buckets, the actual working capacity would be less, and from these causes and the losses from wear and tear, breakages and repairs, the cost of operating would be increased. The cost of the dredge, complete, upon the river is said to have been $25,000.

"In the evolution of the dredger into the elevator or chain-bucket machine, now the popular form, the various kind of dredges were given trials. The dipper dredge is not adapted to dredging for gold, because it disturbs the gravel in the act of digging, and some of the gold is lost. With agitation of the gravel the gold soon settles, and is not recovered.

"It is also very difficult, if not impossible, to construct a dipper dredge that is watertight. Another objection is that the material is supplied intermittently, thus making necessary certain undesirable arrangements for supplying the material in a continuous flow to the gold-saving tables. The same objections apply with greater force to the clam-shell form of dredge. It is by no means watertight, and loses most of the gold in the act of dredging and bringing up the gravel. The objections would seem not to have the same force if applied to hard cemented gravel, or to gravel with sufficient clay or other binding material to make it consistent. It is well to remember that these forms of dredges are, in many positions, economical of operation.

"The hydraulic dredge has had fair trials and proved a failure Large stones greatly lessen the efficiency of this form of dredge, and numerous boulders hamper the pumping work. The suction force being intense, near the pipe, and decreasing rapidly a short distance away, causes the sand and gravel to be carried off, leaving the gold behind.

"A centrifugal pump is, therefore, of little use to catch coarse gold and clear a hard uneven bottom. Cutters do not remove the trouble, since the gravel is disturbed by the cutting, and the gold is separated therefrom.

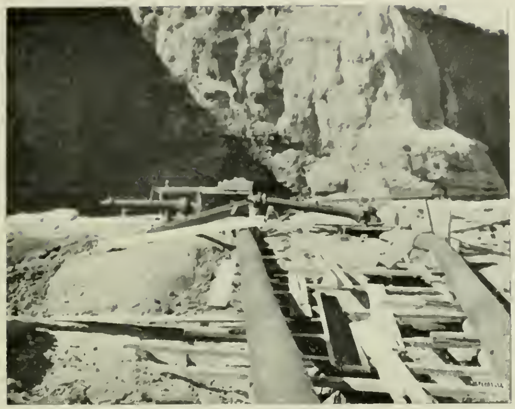
"These objections would not obtain under certain conditions, and it would seem quite possible that conditions might be found existing where the suction dredge might be arranged to do good work. A dredging company is now constructing at Seattle, two dredges of the suction type, to operate upon the Yukon River. This would indicate that there are those who believe that deposits occur in and along that river, which can be successfully worked in this way.

"The chain-bucket machine, the popular form for operating under average conditions, is a combination of the following elements:—An excavating apparatus which clears the bottom and handles the material with little agitation, and slowly and continuously delivers a regular quantity of gravel to the gold-saving appliances; a revolving screen to receive and wash the material, and separate the coarse from the fine; an elevator or contrívance for carrying off the coarse gravel and stones; a gold-saving arrangement or tables, over which the fine material passes and upon which the gold is caught; a pumping apparatus to supply water for washing and sluicing.

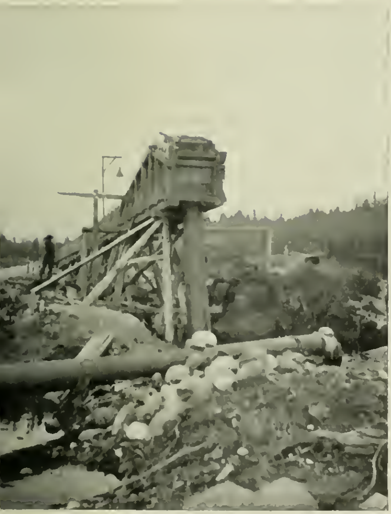
"The proper capacity of a machine seems to be regulated by the capacity of the gold-saving appliances. The table should be as wide as possible, with frequent drops, and the fine material should be distributed over the tables in a thin film. The tables are covered with plush or cocoa matting, and sufficient water supplied to keep the material clear. The material should be supplied evenly, continuously, and regularly to the tables. Care and attention are required to catch the fine gold. A disregard of the foregoing, results in great loss, more particularly in the fine gold. Mechanical skill is required to properly design and construct a dredge, and the care of a competent mechanic is necessary to see that the machine is kept in order and economically operated.

"This saving of gold, however, is what makes dredging operations a commercial success. A man skilled in these matters should be in charge of mining operations. Dredges should be built of determined capacities, and should be designed to suit the conditions under which they are operated. Careful examination and investigation of the ground to be worked should be made beforehand, and the surrounding conditions studied, and it goes without saying that these matters require engineering skill and experience.

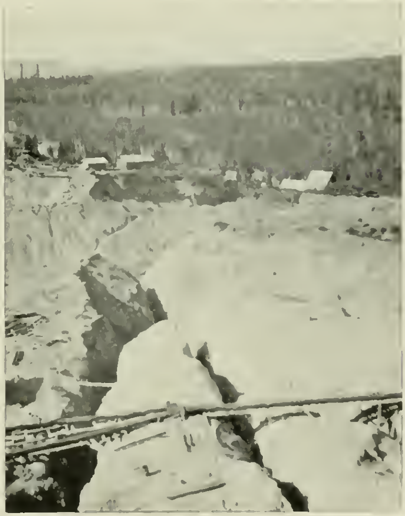
"The field for dredging for gold seems large. Where the proper conditions exist, it is a system which commends itself, and which gives promise, in competent hands, of being an



CEMENTED GRAVEL, HORSEFLY MINE.



HYDRAULIC ELEVATOR.



HORSEFLY MINE.

VIEWS ON HORSEFLY RIVER, CARIBOO.

economical method of mining. There is probably a very large extent of country where dredging for gold will be carried on profitably. Ground need not be in a river, if there is seepage water sufficient to float the dredge and supply water for the saving of the gold. Dredging requires little water as compared with that required for sluicing and elevating, and this water can in many dry localities be supplied at small expense, where a supply for hydraulic work or elevating would cost a very large sum or be impossible at any cost. Any power suitable for driving the prime motors can be utilized to run the dredge. Indeed, it would seem as if a system of mining was about to be perfected which may make possible the profitable working of many deposits not easy to be worked by other methods, and which may, in many instances, solve problems regarding the successful working of deposits which hitherto have seemed most perplexing, and even impossible of solution. Some doubt exists as to possible economical dredging operations under water of torrential streams. The strong currents, frequent floods and many large boulders found in the channels of such streams make the working of the machines difficult and costly. This would not be so much the case in the long stretches of less current, nor would it be so at all in the valley-like reaches in the lower portions of such streams, nor in the wide, flat portions of country where the streams enter the plains.

"Although dredging for gold as a method of mining has passed the experimental stage, there is a great lack of reliable data regarding all details of operations and the actual cost of real and continued working. For this reason it would seem especially desirable that all projected enterprises, in the way of dredging work, should first receive the most careful investigation, and that afterwards all operations undertaken should be under the direction of skilled and experienced men."

CASSIAR DISTRICT.

Since the issue of the Report of 1896, a year ago, the discoveries of placer gold on the Klondike and its tributaries in Canadian Yukon have become known throughout the world, and now is being seen a wild rush of prospectors, investors, speculators and adventurers into this northern region, led on by the desire for gold. In all probability this stampede will surpass any other of the century, as from all quarters of the globe come reports of men leaving for this Arctic Eldorado.

The great northern reaches of British Columbia comprise the districts of Cassiar and Cariboo, of which we know very little, excepting of certain isolated portions, and great areas have never been explored for the precious metals; but the Omineca and Cassiar have in the past produced considerable placer gold, and, it is claimed, quartz untested and unworked is to be found in these districts.

This year will see the beginning of a great influx of prospectors, as many, instead of going farther north into the Yukon, are preparing to enter and prospect Cassiar and northern Cariboo, and parties will be entering by all known means of ingress, and by every route. The interest and excitement now aroused, the building of two lines of railroads, and the opening up of new roads and trails, are now about to effect the exploration of a great amount of territory hitherto almost totally unknown.

Reports. As applications for reports, information, etc., concerning this part of the Province are now becoming very numerous, it has been thought wise to embody in this report all authentic information available, and as the reports by Dr. Dawson, Dr. Selwyn and Mr. McConnell, who have explored parts of this district, are the most authentic, extracts from their reports in the "Reports of the Geological Survey of Canada" are herein collected, so that this valuable data may be the more easily available.

Several routes will be traversed.

Routes. (*a*.) *Via* Edmonton, in the N. W. T., up the Peace, Finlay and Parsnip Rivers. This route will have to be opened up to a very great extent by those new entering, and is more fully described below.

(*b*.) From Ashcroft to Quesnellemouth, thence by trail into the Omineca District, and on to the Stikine River, or by water and portage to the waters of the Parsnip and Finlay Rivers.

(*c.*) By the Skeena River to Hazelton, and thence by trail into the Omineca.

(*d.*) By the Stikine River with steamers to Telegraph Creek or Glenora, whence the northern part of Cassiar can now be reached by trails and water-ways, and in another year by two lines of railroads.

Railroads.

The Dominion Government has granted a charter to Messrs. McKenzie and Mann to construct a railroad from Telegraph Creek or Glenora, at the head of navigation on the Stikine, to Teslin Lake, to be completed by September 1st, 1898. This line may be extended to a point in British territory on the Pacific seaboard. From Teslin Lake steamers properly constructed for these waters can run through to Dawson City.

The Provincial Government has granted a charter, with land concessions, to the Cassiar Central Railway Company, and this company is preparing to build a railroad from Glenora to Dease Lake, and is also preparing to offer very favourable inducements to prospectors entering this part of Cassiar to search for gold, more especially gold-bearing quartz ledges.

Hence with all this work soon to be in progress before so very long, far greater means of of access will be afforded, and it will be possible to get in supplies, machinery, etc., and at much more reasonable costs. The following information is now appended as excerpted from the Geological Reports.

These reports of Dr. Dawson and Mr. McConnell will be found to be very interesting and valuable, and the fulfilment now of predictions made ten years ago by Dr. Dawson well repay his arduous labours in this little-known land.

CASSIAR.

(A)—"MINERAL WEALTH OF BRITISH COLUMBIA."

By Dr. G. M. Dawson, 1888.

"The Cassiar District includes the most northern region of gold mining in British Columbia, and some of the creeks which have been worked lie to the north of the 60th parallel, or northern boundary of the Province. Dease Lake, latitude 58° 30′, longitude 130° may be considered as the central point of the district. This lake is the source of the river of the same name, which is a tributary of the Liard, itself a branch of the Mackenzie. Gold had already been found and worked on the river bars of the Stikine for eleven years, when Thibert and McCullough, coming from the east reached and discovered the rich deposits of the Liard drainage basin in 1872. The miners, who soon flocked into the district, came by way of the Stikine River, though a route for cattle and pack animals was also opened overland from Fraser Lake. Dease, Thibert and McDame Creeks and their tributaries have proved the richest, and a large quantity of gold has been obtained from them, though the yield has, of late years, become comparatively inconsiderable. The region presenting identical or analogous characters with that portion of it which proved to contain these rich deposits is very extensive, and much the same remarks which have been made in regard to the exploration of the Omineca District apply here also, though the cost of living in Cassiar has usually been somewhat more moderate. The country is generally wooded and mountainous and difficult to traverse, but a waggon road or even a railway might, without difficulty, be constructed from the head of navigation on the Stikine to Dease Lake, and this will, no doubt, eventually be accomplished, as discoveries of veins containing the precious metals are confidently to be anticipated. Argentiferous galena has already been found, and the rough, unworn character of the gold on some of the creeks leads to the belief that its source might be ascertained without great difficulty. "Coarse" gold is found locally on that part of the Stikine above Telegraph Creek, and the circumstances appear to indicate the existence there of an old channel above the present river-level, but covered by massive flows of basalt of Tertiary age.

"Difficulties have been encountered in this district from permanently frozen soil met with in mining, but when once the covering of forest and moss had been cleared off by fire these disappear.

"The gold-yield of the Cassiar District, from the commencement of mining to the present date, so far as known is shewn in the following table, which, however, gives no returns for the earlier years of mining, when work was confined to the Stickine River:

1873	Not known.
1874	$1,000,000
1875	830,000
1876	556,474
1877	499,830
1878	519,720
1879	405,200
1880	297,850
1881	198,900
1882	182,800
1883	119,000
1884	101,600
1885	50,600
1886	63,610
1887	60,485
1888	43,325
Total	$4,929,394"

(B.)—DR. G. M. DAWSON'S REPORT ON "EXPLORATION OF THE YUKON, ETC.," 1887.

Routes. "Dease Lake can be reached with difficulty from the coast by ascending the Stickine River 138 miles to Telegraph Creek, and thence by pack train 62½ miles to the lake. The country north-west of the lake and west of Cassiar Range to the head of Teslin Lake and Tagish Lake could be entered by Taku Inlet and river, which can be ascended in canoes for 80 miles. These routes are fully described in subsequent pages."

Topography. The following notes on the topography of Cassiar District and neighbourhood are taken from Dr. Dawson's Report on an Exploration in the Yukon District, N. W. T., and adjacent northern portion of British Columbia, 1887:

Drainage. "The region traversed, including the extreme northern part of British Columbia and the southern part of the Yukon District, is drained by three great river systems, its waters reaching the Pacific by the Stickine, the Mackenzie (and eventually the Arctic Ocean) by the Liard, and the Behring Sea by the Yukon. The eastern part of the region is divided between the two first named rivers whose tributary streams interlock, the Stickine making its way completely through the Coast Range in a south-westerly direction, while the Liard or a north-easterly bearing, cuts across the Rocky Mountains to the Mackenzie Valley. The watershed separating these rivers near Dease Lake has a height of 2,730 feet, and both streams may be generally characterized as very rapid.

Watershed. "To the north-westward branches of the Stickine and Liard again interlock with the headwaters of several tributaries of the Yukon, which here unwater the entire great area enclosed on one side by the Coast Range, on the other by the Rocky Mountains. As the general direction of this line of watershed is transverse to that of the main orographic ridges of the country it will probably be found when traced in detail to be very sinuous. The actual watershed, between the Liard and Pelly, was found to have an elevation of 3,150 feet, but it is no doubt much lower in the central portion of the region between the Rocky Mountains and Coast Ranges.

"To the north of the Stickine at least one other river, the Taku, cuts like it completely across the Coast Range, but this basin is comparatively restricted and little is yet known of it.

Courses of Rivers.

"It will be noticed that while the several branches of the Yukon conform in a general way to the main orographic axis, the Stickine and Liard appear to be to a large degree independent of these, and to flow counter to the direction of three mountain ranges.

Relief of the Region.

"The region as a whole, being a portion of the Cordillera belt of the west coast, is naturally mountainous in general character, but it comprises as well important areas of merely hilly or gently rolling country besides many wide, flat-bottomed river valleys. It is, moreover, higher and more mountainous in its south-eastern part. That drained by the Stickine and Liard, and subsides gradually, and apparently uniformly to the north-westward; the mountains at the same time becoming more isolated and being separated by broad tracts of low land. The general base-level, or height of the main valleys, within the Coast Ranges, thus declines from about 2,500 feet to nearly 1,500 at the confluence of the Lewis and Pelly Rivers, and the average base-level of the entire region may be stated as being a little over 2,000 feet.

Trend of Ranges.

"Disregarding minor irregularities, it is found that the trend of the main mountain ranges and ridges shown throughout the entire region here described a general parallelism to the outline of the coast. In the south-eastern and more rugged tract, the bearing of such ranges as are well defined is north-west by south-east, while beyond a line which may be drawn between the head of Lynn Canal and Frances Lake the trend gradually changes to north-west.

Coast Ranges.

"The Coast Ranges, with an aggregate average width of about 80 miles, the whole of which is closely set with high, rounded or rugged mountains, constitutes the most important orographic uplift in the entire region, and here reproduces geographically and geologically the features characteristic of it in the more southern portion of British Columbia. Notwithstanding the great width of the Coast Ranges, it is not known that any of their constituent mountains attain very notable altitudes, but it is probable that a great number of the peaks exceed a height of 8,000 feet. These ranges are composed of very numerous mountain ridges, which are not always uniform in direction and, so far as has been observed, there is no single culminating or dominant range which can be traced to any considerable distance.

Rocky Mountain Ranges.

"The mountain axis next in importance to that of the Coast Range is that which forms the water-parting between the Upper Liard and Yukon on the one side, and the feeders of the main Mackenzie River on the other. This represents the north-western continuation of the Rocky Mountains proper. It forms, as far as has been ascertained, the culminating range of a number of more or less exactly parallel ridges and summits in it, attain heights of from 7,000 to 9,000 feet.

Cassiar Range.

"A third notable mountain axis, which I have designated the Cassiar Range, is cut through by the Dease River in its upper course, and further to the north-westward appears to form the line of water-parting between the tributaries of the Upper Liard and those of the branches of the Yukon. Peaks near the Dease in this range exceed 7,000 feet, but it is probable that none such exceed 8,000 feet, and that the range in general may become lower to the north-westward.

"In the north-western and more elevated moiety of the region the mountain ranges and ridges are in general lower, and become discontinuous and irregular or, while retaining a general parallelism, assume an overlapping or echelon-like arrangement.

Granite Rocks.

"In each of these mountain chains above described granitic rocks appear in greater or less force. In the intervening and subordinate mountain systems of the south-east granitic axis are not found, and do not exist as permanent features.

Effects of the Glacial Period.

"The topographical features of the entire region here described have been considerably modified by the events of the glacial period, and the changes produced at that time have more particularly affected the drainage basins and the courses of the various streams. The valleys and lower tracts of country are now, more or less, completely filled or covered by extensive deposits of boulder clay, gravel, sand and silt laid down during that period. To these deposits are due the flat floors of the large valleys, and also to a great extent the appearance which the more irregular mountain regions present of being partly submerged in level or rolling plains. Many changes in direction of flow in river valleys have doubtless also been produced during this period.

The general result has been to produce systems of inconsequent drainage wherever the natural slopes of the country are easy and the limiting ranges irregular. Most of the rivers at the present day have done little more than cut out new channels in the glacial débris, touching only here and there upon the subjacent rocky floor.

Navigable Waters and Routes of Travel.

Navigable Rivers.

"The numerous large and important rivers by which the Yukon district and the adjacent northern portion of British Columbia is intersected constitute the principal routes of travel, and during the summer routes render water communication comparatively easy. The Stickine is navigable by stern-wheel steamers for a distance of 138 miles. This constitutes the travelled route to the Cassiar mining district. A trail was at one time opened from Fraser Lake overland to Dease Lake by which cattle were driven through, but of late no travel has occurred on it. The Dease River can scarcely be considered as navigable for steamers, though constituting a fairly good boat route. The Upper Liard and Frances rivers, above the mouth of the Dease, are also passable for large boats with occasional portages, but not so for steamers. The difficulties of the lower Liard, however, are such as to render it an undesirable route, even for boats, and scarcely suitable as an avenue of trade between Cassiar and the Mackenzie. Numerous tributary streams in this district may also be ascended by boat or canoe for considerable distances, though with many interruptions from rapid and bad waters.

Railroad Route.

"Communication may easily be established by railroad from the mouth of the Stickine to the centre of the Omineca District and beyond, when this shall be called for, and it is probable also that this district might without difficulty be connected by rail with the more southern portions of British Columbia by one or more routes, of which the main outlines can already be indicated. Following the river valleys, by a route practicable for a railway from Rothsay Point, at the mouth of the Stickine, to the mouth of the Dease, the distance is found to be 330 miles. Thence to Fort Simpson, on the Mackenzie, is a further distance of 390 miles, making the total distance by this route, from the Pacific to the navigable waters of the Mackenzie, about 720 miles only.

Taku River.

" Little is yet known of the Taku River, but the Indians ascend it in canoes to a point at a distance of about eighty miles from the head of Taku Inlet, and Indian trails lead south-eastward from this vicinity to the Tahltan eastward to Teslin Lake, and north-eastward to the lake near the head of the Lewes. From what has been ascertained of these, it is probable that it would not be difficult to construct a trail suitable for pack-animals, if not a waggon road, from the vicinity of the head of navigation on the Stickine, to those lakes connecting with the navigable waters of the Lewes.

Yukon Tributaries.

" The rivers draining the Upper Yukon basin, have in general lower grades, and afford better navigable waters than those above referred to, and in consequence likely to prove of greater importance in connection with the exploration and development of the country. The distance to which they may be respectively ascended by boat or canoe has as yet been determined in only a few cases.

" It may, however, be stated that the Yukon is continuously navigable for small steamers from its mouth, on Behring Sea, following the Lewes branch to Miles Canyon ; thence after an interruption of about three miles, to the head of Bennet Lake and to an additional considerable, though not precisely determined distance, by the waters extending south-eastward from Tagish Lake. The Tes-lin-too is probably navigable for stern wheel steamers for 150 miles or more from its mouth, while the Tahk-hecua and Big Salmon Rivers may probably both be ascended by steamer of the same class for some distance. From the site of old Fort Selkirk, again, the Pelly River might be navigable by small steamers of good power, to within about 50 miles of the site of old Fort Pelly banks, and the Macmillan branch is also navigable for a considerable though not ascertained distance. The same may be said of the Stewart River, but White River is, so far as known, very swift and shoal.

"The total length of the waters which may be utilized for navigation by light steamers on the main river and its branches to the east of the 141st meridian or Alaskan boundaries, measured in straight lines of 50 miles, is therefore at least 1,061 miles, and following the sinuosities of the various streams would be very much greater. This does not include the Porcupine River, and, with the exception of the single break referred to on the Lewes, form a connected system, all parts of which lie to the east of the above meridian. If the upper portion of these rivers, above the first obstacles to such navigation, were included, the total here given would doubtless be greatly added to.

"At the present moment, these routes of access to the Yukon district are employed (1) that of the portage by the Chilcoot Pass from the head of Lynn Canal to the navigable waters of the Yukon; (2) that from Peace River, near its confluence with the Mackenzie, by portage to La Pierre's house on a branch of the Porcupine; (3) from Behring Sea by the main river. The first is almost exclusively used by the miners, the second is employed only by the Hudson Bay Company, and the last is that of the Alaska traders.

Stickine River.

"Since the year 1873, when the placer gold mines of Cassiar were first developed, the Stickine River has become a somewhat important avenue of communication from the coast to the interior of the northern part of British Columbia. Like the Fraser, the Skeena, the Naas, and several other small streams, it rises to the east of the broad belt of mountains which constitutes the Coast Range, and cuts completely through this belt with a nearly uniform gradient. In size and general character, the Stickine closely resembles the Skeena, which reaches the coast 200 miles farther south. It is navigable for stern-wheel steamers of light draught and good power to Glenora, 126 miles from Rothsay Point at its mouth, and, under favourable circumstances, to Telegraph Creek, 12 miles farther.

"Above Telegraph Creek is the 'Great Canyon,' which extends for many miles, and is quite impassable either for steamers or boats, though traversed by miners in winter on the ice. The headwaters of the Stickine are unknown, but lie for the most part to the south of the 58th parallel of north latitude, in a country said to be very mountainous, interlocking there with northern branches of the Naas and western feeders of the Black or Turnagain River, a tributary of the Liard. From Telegraph Creek, the head of navigation, a pack trail 62½ miles in length, constructed by the British Columbian Government, follows the valley of the Stickine, generally at no great distance from the river, and eventually crosses from the Tangilla, or third north fork, to the head of Dease Lake, which may be regarded as the centre of the Cassiar mining district. This route has long been known to the Indians, the Stickine having been to them, from time immemorial, an important avenue of trade, by which, as by the Skeena, the coast tribes penetrated a considerable distance inland.

Current.

"The current of the navigable portion of the Stickine is swift throughout, but there are no rapids properly so called, though the Little Canyon (75 miles from the mouth) forms a serious impediment to navigation when the river is at its highest stage in June or July, in consequence of the great velocity of the current in this narrow and rocky, though deep, gorge. Near the mouth of the river, the current scarcely impasses two miles an hour, but it increases as the river is ascended, till it attains a rate of six to seven miles in many places, the swifter water being chiefly met with above Little Canyon. The average rate of flow of the navigable portion of the river must be about five miles an hour.

Navigation.

"Stern-wheel steamers for the navigation of the river should have good engine power, and should draw not more than four feet of water when loaded. Under ordinary circumstances, the ascent of the river to Telegraph Creek, with a suitable steamer, occupies about three days, and it is generally necessary to carry a line ashore at a few places. The extensive flats near the mouth of the river render it necessary to enter it about high tide. A considerable proportion of the traffic is carried on by Indians with canoes; the Stickine Indians are very expert in all the necessary operations of tracking and poling in swift water.

Iskoot River.

"The Stickine is joined by some important tributaries, the Iskoot or Skoot, which flows in from the eastward about 35 miles from the mouth, or just within the locally culminating range of the Coast Mountains, is known to be navigable for some distance by canoes, and one branch is said to head not far from the extremity of Portland Canal to the southward. By following this river to its head and there making a portage, the Indians are reported to be able to reach the Naas River without difficulty. The Iskoot has been prospected by a few miners, but apparently without any notable result, though the Indians report the occurrence of coal.

Scud River.

"About seven miles below the Little Canyon, the valley of the Scud River opens to the east. Some gold has been found by prospectors on this stream, but no workable placer deposits.

Clearwater River.

"Six miles above Kloochman Canyon, 14 miles above Little Canyon, the Clearwater River enters the Stickine on the west side by several mouths. This is a stream of considerable size and is navigable for canoes for some distance.

First Fork.

"The first south fork joins the Stickine about 1½ miles below Telegraph Creek. It is a large turbid stream and for a number of miles from the main river flows in a rough narrow gorge, between high hills and mountains. Further up, according to the Telegraph Exploration Sketch, it is bordered by level partly timbered terraces or benches.

Telegraph Creek.

"Telegraph Creek is an inconsiderable stream which falls rapidly to the river through a narrow rocky cliff in the bordering hills of the right or north-west bank of the Stickine. The little town of Telegraph Creek occupies the narrow delta of the stream and the lower terraces bordering it on both sides. Glenora, 12 miles below Telegraph Creek and on the same side of the Stickine, consists of a single row of houses built along the edge of the river at the foot of a steep bank.

Glaciers.

"The glaciers constitute one of the most remarkable features of this part of the Stickine Valley. There are a number of these on both sides of the river in its lower part, but form only a special importance, all of which are situated to the west of the river and all but the first on the eastern slope of the most massive central ranges of the mountainous region. The first or little glacier fills a high valley on the north side of the river, about 10 miles from its mouth. The next, and most important glacier, is that universally known on the river as the Great Glacier. The high snowfields from which this glacier must take its rise are not seen from the river, the glacier entering the wide valley of the Stickine nearly at right angles, through a break in the mountains two to three miles distant from the river bank. Before entering the Stickine Valley the glacier has a width estimated at from one-half to three-quarters of a mile, but upon freeing itself from the bordering mountains immediately expands in a fanlike manner, its actual front upon the river being from three to three and a half miles in width. Ten miles above the Great Glacier, and also on the west side of the valley, is the Dirt Glacier, so named by the miners because of the great quantity of rocky débris with which its surface is covered. This is much smaller than the last, bearing a width estimated at a quarter of a mile, but possibly greater than this. Like the Great Glacier, it comes quite down on the river flats.

"The last important glacier, 16 miles still further up the river, is the Flood Glacier. This also comes down to the level of the river flats, but does not closely approach the river. From the valley of this glacier a great rush of water occurs almost every year towards the end of summer. This, no doubt, arises from the blocking by the glacier of the mouth of some lateral valley in which a lake is formed and, from time to time, breaks through the glacier dam. The quantity of water thus liberated is so great as to raise the river from a low stage to half-flood level for a short time. There is a large quantity of débris also on this glacier, though less than on the last.

Cassiar Trail.

"The trail from Telegraph Creek to the head of Dease Lake was opened by the Government of British Columbia, 1874. It has since been kept in a fair state of repair, and is a good route for pack animals. It follows the north side of the Stickine and Tangilla valleys, and is 62½ miles in total length The same important valley which is occupied by the Stickine below Telegraph Creek continues in a north-eastward direction to Dease Lake, the main stream of the Stickine entering it from the southward, about midway between these two points.

To Tahl-Tan.

"On leaving Telegraph Creek the trail makes a steep ascent to the level of a broad terrace, and runs along at a considerable height above the river and often at some distance from it, till it descends again at 11 miles to the valley of the Tahl-tan or First North Fork, near its mouth. The main valley of the Stickine is here about four miles in width, and is bordered by high hills and by mountains of rounded forms, those to the north often nearly bare, while those on the opposite side are generally either wooded or strewn, where fires have passed, with burnt logs. The river occupies a canyon with precipitous banks, often 300 feet high, which has been cut in the bottom of this great valley. It is very rough and rapid, but there are no true falls. Terraces are well developed at several levels on both sides of the river which is frequently bordered by vertical basaltic cliffs. . . . The country traversed by the trail between Telegraph Creek and the Tahl-Tan is wooded only in patches, the trees being chiefly black pine and aspen.

Tahl-Tan.

"The Tahl-tan River is crossed near its mouth by a good bridge. It is a large, rapid stream which rises about 30 miles to the north-westward. Its valley is narrow and almost canyon-like where it reaches the Stickine, and has cut through basaltic flows and heavy underlying gravel deposits to a depth of about 150 feet, though its right bank, just above the crossing, is composed of the older rocks. Gold mining was, at one time, carried on successfully for some miles up the Tahl-tan valley.

Tooya.

"The distance from the Tahl-tan to the Tooya or Second North Fork is about six miles. For about half this distance, to Ward's house (now like other places of call along this route, abandoned), the trail runs near the Stickine River, the immediate valley of which still continues to be occupied by basaltic flows. The trail then turns away from the river and cuts across a high point to the Tooya, the highest terrace level crossed being about 1,000 feet above the river. The Tooya valley, where it is crossed by the trail, is a great gorge about 600 feet in depth, cut out through the terrace deposits. The river, which is spanned by a small bridge, is a wild torrent, almost a series of cascades. A lake of considerable size is reported to exist on the upper part of the river.

"About a mile beyond the Tooya, on the summit of a wide, undulating plateau, is Wilson's house. From here to Cariboo Camp, about 12 miles, the trail crosses an extensive high terrace or plateau which is generally wooded with aspen, black pine and white spruce of fair growth. A few very small streams which flow toward the main valley are crossed, but the river is generally some miles distant and scarcely visible from the trail. The Tooya valley is here said to run nearly parallel with the main valley of the Stickine and at no great distance from it, but is invisible from the trail. About midway between Wilson's and Cariboo Camp the Stickine, or Too-dessa of the Tahl-tan Indians, coming from the southward, enters the main valley cutting through the bordering mountains in a narrow canyon which the Indians report impassable. Their route to the upper waters of the river crosses the mountains to the west of the canyon.

Tanzilla.

"The trail reaches the edge of the valley of the Tanzilla or third North Fork, about a mile south-westward from Cariboo Camp. This valley is cut out to a depth of 450 feet below the level of the plateau, and is about a mile in width from rim to rim. The sides show evidence of extensive land-slides, both old and recent. The river is a comparatively small, though swift and muddy stream, with an estimated width of 180 feet, and depth of about 3 feet. From Cariboo Camp to the vicinity of Dease Lake, or for about 26 miles, the trail runs along the north-west side of the Tanzilla. The valley of the stream gradually loses its depth. The mountains which extend to the south-east of the river here become higher than before, and take the form of a well marked range, which is known to the Indians as Ho-tai-luh. Swampy spots become frequent. A great part of the forest all along this portion of the valley has been destroyed by fire.

"Opposite the head of Dease Lake, the Tanzilla turns off abruptly. The main valley turns northward through a right angle, and becomes continuous with that of Dease Lake. The distance from the head of the lake to the Tanzilla at the nearest point, is about 3 miles. The height of land is about 70 feet above the lake, or 2,730 feet above the sea, and constitutes the watershed between the Arctic and Pacific Slopes.

Dease Lake.

"Dease Lake has an elevation of 2,600 feet above the sea, and lies nearly due north and south on the 130th meridian. It has a total length of 24½ miles, with an average width of rather less than one mile, being somewhat narrower at the northern than at the southern and Dease Creek, on the delta of which is situated Laketon, the chief place of Cassiar District. It is also the most important, as being that on which gold is still worked to a limited extent. A certain amount of business is still carried on here, and it is the head-quarters of the Gold Commissioner. At Porter's Landing, on the west side of the lake, near its north end, goods are landed for Thibert's Creek. A small steamer on the lake is employed in making occasional trips up and down the lake with supplies. The country about the lake is everywhere wooded, though trees large enough for lumber are found only in sheltered valleys, or on low land. It is not roughly mountainous, though several prominent peaks occur. (Geol. Survey Report B., 1888, Dr. Dawson).

Dease River.

"From Dease Lake the general course of the river, disregarding minor flexures, is N. 50° E. for 47 miles, to a point near the valley of Rapid River. Here, before it has fed itself from the Cassiar Range, it turns nearly at right-angles to a bearing of N. 15° W., which it maintains for 31 miles; thence it again turns for a second time through a right-angle to a course of N. 55° E., which it follows to its junction with the Liard. Its entire length * * * following all the sinuosities of the stream, is 180 miles * * * The river from Dease Lake to the Liard may easily be descended in two days, but the ascent is a comparatively slow process, depending much on the height of the water and when the bars and benches are not bare, for tracking is a tedious affair.

"On leaving Dease Lake the river is a small stream, estimated to average from 100 to 150 feet only in width, with a general middle depth of about 3 feet. It is extremely tortuous and rather swift, meandering in a wide flat valley. At about 8 miles from the lake, it may be said distinctly to enter the mountains, the valley at the same time gradually narrowing and becoming bordered by mountains from 4,500 to 5,000 feet in height. At about 13 miles from Dease Lake it expands into a little lake about a mile and three-quarters in length, and between this and the mouth of Cottonwood Creek it flows through three more similar lake-like expansions. These lakes constitute somewhat serious impediments to navigation, as they freeze over in the autum long before the ice takes in the river and remains frozen till late in the spring.

"Dease River rapidly increases in size, and after the lake is left soon doubles it volume, owing to the number of affluent streams of which Cottonwood Creek is the first, which may be called a river. This stream occupies an important valley which may be observed to run for many miles in a north-westward direction, bordered by continuous high ranges. It is remarkable that no paying deposits of gold have been found either on this or on Eagle River, which enters the Dease from the south, about 4 miles further down. Eagle River also flows between high mountains, and its valley appears to be parallel to and analogous with that occupied by Dease Lake.

"Immediately below the mouth of Cottonwood Creek, is Cottonwood Rapid, not a formidable one or at all dangerous to run with ordinary care. The river below Cottonwood Creek runs nearly due east, and for about 10 miles with a rather strong current. It then turns more to the northward, and after making several large flexures reaches Sylvester's Landing at the mouth of McDame Creek in about 8 miles. In this reach the current is slack, and the river averages 300 feet in width. The flat land of the river valley is rather wide in this part of its length, but the mountains to the north and south are high and bold, many of the summits ranging from 6,000 to 7,000 feet. The lower slopes of the mountains are usually light and in general thickly wooded, but their higher parts are treeless, and from the quantity of snow borne by them in June must retain some snow throughout the summer.

Sylvester's Landing.

"Sylvester's Landing is the point of supply for the miners on McDame Creek, also a post for Indian trade, and there are here a few log cabin houses and store buildings. The valley of McDame Creek is wide and important, running north-westward for about 7 miles and then turning nearly due west. At the angle thus formed a low wide pass leads through the mountains to the north-eastward where it connects with the valley of the Dease. The appearance of this pass, as seen from a distance, is such as to suggest that the Dease River itself may at some former period have flowed through it.

McDame Mountains.

"The mountains bordering McDame Creek, viewed from Sylvester's Landing, are singularly different from any before met with. They are evidently composed for the most part of limestone, are characterized by the occurrence of long bare slopes of shattered rock fragments, and are scarcely at all wooded.

"Nine miles below Sylvester's Landing, the Dease makes its great bend towards the north, the intervening portion of the river somewhat changing its character from that above described, rock exposures being comparatively frequent in its bank and bed where they produce several small rapids.

"Four-Mile Creek enters from the south at somewhat less than the specified distance below Sylvester's. Sylvester's Trail to Turnagain or Black River (muddy river of miners) runs up this valley and follows a tributary (Sheep Creek) to the south-eastward. The distance to the trading post, or Turnagain River, is estimated at 90 miles, but it is probably less. Horses are employed in packing over the trail.

Rapid River.

"The valley of the Rapid River joins that of the Dease, and its great bend just alluded to, but the stream running parallel with the Dease for some distance, enters it several miles lower down. Beyond this great bend the mountains near the river decrease rather notably in height and abruptness, and at the same time retreat from the vicinity of the river, the valley becoming very wide and long, hummocky slopes or groups of low hills coming in between the river and the mountains.

"The northerly course of the river here carries it very obliquely through the eastern portion of the Cassiar Range. The precipitation in this part of the valley is evidently inconsiderable. Sylvester successfully winters his horses here without cutting hay, or otherwise providing for them, the depth of snow in winter being so small that it does not seemingly interfere with grazing. Much of the valley, with the slopes of hill is open or partially wooded with groves of black pine and aspen.

"Below Rapid River the Dease changes its character considerably, becoming relatively wide, with numerous gravel-bars, and in some places many islands with frequent "drift-piles" or accumulation of timber. A few miles below reaching the second great bend, a stream joins from the west, which has become known to the miners as French Creek, and is probably the "Detour River" of old maps. It rises on the north-east slope of the Cassiar mountains, and is not large.

"The last main reach of the Dease is that which extends from the 2nd great bend to its mouth, a distance of 31 miles in a direction of N. 55° E., though the course of the river is far from being direct, the general bearing leaves the base of the Cassiar Range nearly at a right-angle. The country becomes low and uninteresting, and assumes a rather dreary aspect, being covered generally with forest of inferior growth, often degenerating into swamp or northern aspect, and with only occasional grassy openings on slopes with sunny exposures. In descending this part of the river, the mountains soon become invisible from the river valley, which is bordered by undulating lowlands or low hills, which rise to a plateau at some miles distant, 400 or 500 feet above the stream. The climate is more humid than before, and less favourable to vegetation. The current of the river is rather swift, and there are two or three considerable rapids, but none of importance till within four miles of the mouth, where there are several strong rapids, which, at certain stages of the water are reported to be dangerous. Terraces as much as 300 feet in height approach the river in some places in this part of its course, and when cut into generally show stratified gravels, which sometimes rest directly on low exposures of rock.

Blue River.

"Blue River joins the Dease 12 miles below the second great bend. It is a stream 50 feet wide at the mouth, and derives its supply from the north-eastern slopes of the Cassiar Range to the north of French Creek.

Lower Post.

"The Lower Post, which is the furthest outwork of civilization or trade in this direction, is situated at the edge of a terrace 40 feet in height on the left bank of the Liard, about half a mile above the mouth of the Dease. It is of a very unpretentious character, consisting of a few log cabins in the vicinity of which the woods have been entirely destroyed by fire.

"The Liard River is here said to be open as a rule from the 1st of May. In the Autumn of 1886, it was frozen over on November 21st.

Agriculture.

"At Telegraph Creek, and in its vicinity on the Stickine to the east of the Coast range (lat. 58°), wheat, barley and potatoes are successfully grown with the aid of irrigation. Their cultivation has so far been attempted only on a limited scale on account of the want of any market, and wheat has been grown only experimentally, as it cannot, like barley, be employed for feeding pack-animals. None of these crops can be successfully grown or ripened on the coastward side of the mountains.

"Taking into consideration all the facts which I have been able to obtain, as well as those to be derived from an examination of the natural flora of the country and the observed advance of vegetation, which, in the absence of actual experiments are capable of affording valuable data, I feel no hesitation in stating my belief that such hardy crops as barley, rye, turnips and flax can be successfully cultivated in the Yukon District as far north as the former situation of Fort Selkirk, near the 63rd parallel or, in other words, 1,000 miles north of Victoria. Taken in conjunction with the physical features of the region this means that chiefly within the drainage area of the Yukon, for the most part north of the 60th parallel, there exists an area of about 60,000 square miles, of which a large portion may and, doubtless in the future, will be utilised for the cultivation of such crops for local purposes without undue labour, as excellent summer grazing is generally to be found along the river valley, and natural hay meadows are frequent. I do not maintain that the country is suitable for immediate occupation by a large, self-supporting agricultural community, but that agriculture may, before many years, be successfully prosecuted in conjunction with the natural development of the other resources of this great country, of which by far the most valuable portion lies to the east of the line of the Alaskan boundary.

Geology.

"Speaking broadly, the rock series represented are evidently similar to those found in the southern portion of British Columbia, between the Rocky Mountains and the Coast, showing great constancy in lithological characters of the several formations, when followed in the direction of the main north-west and south-east axes of uplift—a constancy which contrasts markedly with the diversity found when comparisons are made as between localities situated at right angles to this direction.

Coast Range.

"The Coast Ranges, where traversed by the valley of the Stickine and again where still further north by the Chilkoot Pass, are found to consist, for the most part, of granite and granitoid rocks almost invariably of grey colour and frequently rich in hornblende. With these are occasionally included stratified or stratiform masses of mica, hornblende, schists, and both these and the granites are frequently traversed by pegmatite veins, diabase dykes and intrusive masses of coarse diorite. The schistose portions of these ranges may possibly represent the still recognizable remnants of rocks of Archæan Age, or may be merely portions of much newer series which have suffered extreme alteration.

"No demonstration of the date of the origin of the granitic rocks of the Coast Range was obtained in this region, but there is every reason to believe that it is comparatively recent and due to a time lying between the Triassic and the Cretaceous, as has been found to be the case with their continuation to the south, near the northern part of Vancouver Island.

"The width of the belt of granitoid rocks comprising the Coast Range is, on the Stickine, about 65 miles, measured from their sea border inland at right angles to the main direction of the mountains. It is somewhat less in the latitude of the Chilkoot Pass, but may be assumed to occupy a border of the mainland about 50 miles in width along the whole of this part of the coast. Broadly viewed, however, the coast archipelago in reality represents a partly submerged margin of the Coast Ranges, and granitic rocks are largely represented in it also.

Interior Region.

"East and north-east of the Coast Range, the interior region traversed is, for the most part, floored by Palæozoic rocks of very varied appearance, and probably referable to several of the main subdivisions of the geological scale. In so far as the information obtained in the region here in question enables conclusions on the subject to be formed, the lowest part of the rocks (1) consists of greenish grey schists, generally feldspathic or hornblendic, but often quartzose and, including distinctly, micaceous and talcose schists with some bands of limestone, the lithological character of this subdivision being exceedingly varied. Apparently overlying these are (2) grey and blackish, often lustrous, and sometimes more or less micaceous calc-schists and quartzites, including beds of limestone of moderate thickness, which are often more or less dolomitic. These are associated with, or pass into (3) black argillites or argillite schists, also containing thin beds of limestone, which on one locality on the Dease have afforded a small number of graptolites of Cambro-Silurian age. Next above these is a series (4) consisting chiefly of massive limestones, generally of grey or blue-grey colour when unaltered, but often locally changed into white or variegated crystalline marbles. On the Dease, on the Frances, and again on Tagish Lake fossils of carboniferous age, including more particularly a species of Fusulina, have been detected in some beds of this limestone series, probably belonging to its upper portion. This limestone appears to be conformably followed, or even in part interbedded with (5) a great mass of more or less evidently stratified rocks of volcanic origin, comprising amygdaloids, agglomerates and other more massive materials, which apparently represent old lava flows.

Volcanic Materials.

"Analogy with the southern portions of British Columbia which I have examined leads me to believe that the greater part of these volcanic materials are also to be classed as of Carboniferous age, but it is quite probable that here, as to the south, they comprise as well rocks of similar appearance which are of Triassic age, but which we are at present unable to separate from them.

Interior Granites.

"The preponderantly Palæozoic floor of the region east of the granites of the Coast Range is broken through on two main lines by granitic axes. The first of these is cut across by the Dease River, a short distance below Dease Lake, and was again met with over 300 miles north-westward on Pelly, near the mouth of the MacMillan. Though referred to as a single granitic axis this uplift probably consists rather of a series of alternating and more or less irregularly shaped granitic masses, which however preserve a general alignment. There are on the upper Pelly in fact three separate granitic ridges in place of the single one met with on the Dease. In close association with these granites are some gneissic rocks and holocrystalline mica hornblende schists. A small tongue of granite occurs on the Lewes a few miles above the mouth of the Little Salmon, which may be connected with the south-western side of the granitic axis. Its further extension in a north-westerly bearing is proved by the occurrence of a great preponderance of rocks of the same character in the collection made by Mr. Ogilvie on the Lower Pelly or Yukon, between the mouth of Lewes and Forty-Mile Creek.

"CONNECTION OF GOLD WITH THE ROCK SERIES.

"On comparing the position of this irregular granitic axis, and its surrounding altered rocks with that of the richer deposits of placer gold so far discovered and worked, it will be found that they are closely associated. The chief placers and river bars are, in fact, scattered along this line or belt, and extend like it all the way from Dease Lake and McDame Creek to Forty-Mile Creek. Evidence was moreover found on the Pelly to show that the development of quartz veins in the Palæozoic rocks has occurred contemporaneously with the upheaval of the granites, and probably by some action superinduced by the granite masses themselves while still in a formative condition. While cutting the stratified rocks the quartz veins seldom or never cut the granite masses in this district. These observations should afford an important clue to the further search for auriferous ground, as well as for the lodes from which the placer gold has itself been derived.

Too-Tsha Range.

"Of the second granitic axis of the interior region very little is yet known, but it is probable that it is still less regular in character than the last. It occurs in the mountainous region to the east of Frances Lake and river, and probably also in the vicinity of the Pelly Lakes. Its lithological characters are those of the last described, and here again in the vicinity of Frances Lake and on the Liard, paying gold placers have been found. The district is, however, so difficult of access that it can scarcely as yet be said to have been at all prospected.

Basalts.

"In the Stickine valley, east of the Coast Range, important local basalt flows are met with, overlying old river and valley gravels, and the lignite reported to exist some miles up the Tahl-tan is doubtless also of Tertiary age and inferior in position to the basalts. Basalt effusions of the sporadic character may be frequent in other places in the region.

"The basalts are at least pre-glacial in age, and though no characteristic fossils were observed in the associated bedded deposits, both may be provisionally classed, from their analogy with similar deposits in the more southern portion of British Columbia, as Miocene.

Geology of Stickine.

"The Great Glacier, rising many miles back in the higher ranges of the mountains in the material which it has brought down and deposited in its moraine, affords a mode of ascertaining the general composition of the central ranges. This material was found by Mr. McConnell to consist almost entirely of grey granite of medium grain, composed of feldspar, quartz, and hornblende in nearly equal proportions, but holding also a little mica and occasional crystals of sphene. Diorites and mica schists occur in smaller quantity, together with coarse pegmatite, which is evidently derived from veins intersecting the granite.

"Similar granitoid rocks, with occasional schistose areas, constitute the whole of the rock exposures seen along the river to the so-called Grand Rapids. The mountains bordering the valley also appear to be entirely, or almost entirely, composed of the same material.

Below Grand Rapids.

"A short distance below Grand Rapids, distinctly stratified rocks of dark colour are seen capping some of the mountains, and resting upon the granites. These beds have a dip 30° to N. 70° E., which brings them down to the level of the river near the rapid. They are there found to consist of hard argillites and grauwacke-quartzites, interbedded with shaly, grey-brownish, impure limestones, the whole being considerably disturbed and cut near the granites by coarse, grey, porphyritic dykes of that rock. They are followed in ascending order by a massive, grey-blue, sub-crystalline limestone of considerable thickness, which can be traced in the mountains for some distance on both sides of the valley.

Above Grand Rapids.

"About two miles and a half above Grand Rapids, near the mouth of the Clearwater, the limestone is followed by a series of altered volcanic rocks, which are, for the most part, of grey and greenish colours. These are, apparently, chiefly diabases, but include also porphyrite-like rocks. About six and a half miles below Glenora, exposures are found of slaty argillites and dark shaly rocks, containing some impure limestone, all very much broken and disturbed, and associated with altered volcanic materials.

Above Glenora.

"From Glenora to Telegraph Creek, basaltic and other comparatively modern volcanic rocks become prominent features, the basalt appearing as remnants of horizontal flows, the broken edges of which form scarped cliffs. The basalts have evidently flowed along and partially filled the old river valley, and unconformably overlie the old altered volcanic rocks previously alluded to, as well as all the other rock veins. About two miles below Glenora, the basaltic rocks were noticed in one place to have filled the old river bed conforming in their lower layers to the slopes of its sides, to have been subsequently cut across obliquely by the present river.

"Between Glenora and Telegraph Creek, the rock seen below the basalts include at least two distinct series. The first and oldest of these is represented by a number of occurrences of altered volcanic rocks, like those previously referred to, as well as by considerable exposures (beginning about a mile above Glenora) of grey-blackish, rather chert quartzites, often nearly on edge. The second consists of slightly indurated conglomerates, sandstones and shales In the immediate vicinity of Telegraph Creek the prevalent rocks, a grey-green speckled altered volcanic material, which proves to be a fine-grained diabase tuff. The high hill immediately opposite Telegraph Creek, on the other side of the river, is composed of similar old volcanic rocks, comprising compact diabase and a massive diabase agglomerate.

Cassiar Trail.

"Respecting the older rocks which characterize the greater part of the country between Telegraph Creek and Dease Lake may be described as consisting of grey and greenish quartzites and grauwackes, with a large proportion of altered volcanic materials, generally feldspathic, but passing into diabases and becoming in some cases more or less schistose. Rock originally of volcanic origin, notably preponderate in the vicinity of Telegraph Creek, while near Dease Lake they are less abundant and about two miles from the lake on the trail, massive grey fine-grained limestone occurs, in exposure and which are nearly continuous for about a mile. None of the mountains in sight on either side of the valley are distinctly granitic, and rocks of this character were observed only in one locality where they occupy a relatively small area.

"At about two miles along the trail, to the south-west of the Tahltan, a dark blackish-green, highly crystalline hornblende rock occurs in considerable mass, and is much broken and shattered by a grey prophyritic and hornblendic granite which appears to be of late date, and which may have a width of about two miles on the trail. In the bed of the Tooya River rocks differing in appearance from any seen elsewhere on this trail were found. They are reddish and purplish in colour, fine-grained, and in some beds slightly porphyritic, and appear to be chiefly feldspathic in composition. One of these is identical with a rock met with in the lower part of the bedded series, a short distance above 'Grand Rapids.'

"The preglacial age of the basaltic rock is shown by their relation to the terraces of the valley, and also by the occurrence upon them of large granitic boulders, the transport of which must be attributed to glacial action. This is seen particularly in some places between Telegraph Creek and the Tahl-tan. The basaltic rocks at the period of their eruption have filled the old river-valley, and may very probably have at one time done so continously from below Glenora to the Tooya, or perhaps considerably further. Subsequent to the period of basaltic eruption the river still flowing in the same great valley has cut down through the basalts in several places exposing sections of the gravel deposits of the ancient river. The new channel thus formed is not, however, co-incident with the old, but cuts across it at several points, and above Telegraph Creek the excavation of the new bed has been covered to a depth estimated at from 40 to 70 feet below the earlier one. A few miles below Glenora, where the basalt filling of the old valley has been cut across it seems, however, that the old river bed is below the present water level, indicating in connection with the previous observation that the grade of the original river was greater than that of the present.

"Old Channels and Gold Placers.

"The basaltic formation of this part of the Stickine has been described in some detail on account of the importance it possesses in respect to the distribution of gold. The gold along the Stickine was said by the miners to be 'spotted' or irregular, in its occurrence, but the greater part of the heavy gold was found just along that portion of the stream now characterized by the basalts and it appears even possible to trace a connection between the richer bars which have been worked and those places in which the present river has cut through or followed the old basalt protected channel. This being the case it seems desirable that the old channel should be fully prospected which I cannot learn has ever been attempted. If gold should be found in it in paying quantity, it might easily be worked and would give rise to a considerable renewal of activity in mining. It is not known to what extent similar conditions may occur up the Tahl-tan Valley, where also remunerative bars were worked some years ago.

Dease Lake.

"It seems probable, from outcrops and float along the lake shore, that the whole country is underlain by Palaeozoic strata, resembling those described to the south-eastward. In addition to the limestone already noted as occurring at the head of the lake, these are grey and greenish rocks, representing altered materials of volcanic origin, associated with leek green serpentine, in which some minute veins of chrysolite or asbestos were noted. Besides these, and probably predominent as a whole in the valley of the lake, are argillite schists, which vary from black plumbaginous to a grey finely micaceous character, and are often lustrous and not infrequently highly calcareous. The rock as a whole closely resembles those of parts of the gold-bearing series of Cariboo District.

Dease River.

"For about 12 miles below the lake the rocks comprising the mountains seem to be referable to the same Palæozoic series which has been described as occurring on Dease Lake, but the exposures examined appeared to be somewhat more highly altered, and in some cases to approach the character of crystalline schists. One bedded rock is probably a diabase, with somewhat lustrous division planes and kernels of epidote.

"GRANITE ROCKS OF CASSIAR DISTRICT.

"Beyond the point above defined, at the first little lake, a granitic area is entered on, which may be regarded as constituting the axis of the Cassiar Range, and which extends on the river to the mouth of the Cottonwood.

"The valley of Cottonwood Creek appears to coincide with the north-eastern edge of the granites for a number of miles. The mountains to the south of it, and extending westward along the north side of the Dease, are evidently composed of stratified rocks, including important beds of limestone.

"The range to the east of McDame Creek is largely composed of limestone, which, striking in a north-west and south-east direction, constitutes also the mountains on the south side of the Dease. The limestones are associated with reddish shales, and near the mouth of the Rapid River were observed to be interbedded with dolomite layers and calcareous schists. The mountains bordering the north and south part of its course between the first and second great bends, appear to be composed throughout of similar rocks.

"Eleven miles south of the second great bend, on the right bank of the river, is a low rocky cliff about 15 feet above the water, capped by about 10 feet of bedded white silts. The rocks are blackish sandy shales rather hard in some places, carbonaceous and holding a little impure lignite. They are extremely irregular in dip, and are broken and jumbled up with a hard grey quartzite, which is seen in places as the underlying rock, but is even then singularly shattered."

(C).—REPORT BY MR. JAS. PORTER, GOLD COMMISSIONER, LAKETON.

"The total yield of gold for the district this season, as you will observe, is small, and certainly does not look very encouraging when received only in the light of the past few years. But even then, taking all into consideration, it is not such a bad showing after all, for the greater part of it has been mined by a few old Chinese miners, who seem to be quite satisfied to continue scratching year after year in the old workings met with along the different creeks. Now, beyond a doubt, this hitherto almost forgotten part of the Province is about to bloom into prosperity and mining activity, and it is my honest belief that, instead of the annual output of gold being what it is to-day, the returns of the near future will be enumerated by the hundreds of thousands of dollars.

"Altogether, quite a number of new faces were met with here during the season, and two-thirds of them were turned in various directions in quest of quartz. I am pleased to be able to say that some very good-looking rock has been discovered, and, as a result, some seventy-eight mineral claims have been recorded. A considerable quantity of ore from some of these ledges has been taken to the coast for assay, and I firmly believe that some of it will give good results, as gold could be seen plainly with the naked eye.

"Some attention has been given towards securing placer mining properties in the district. Three applications are on file for leases of half a mile each of creek on the third north fork of McDame Creek; applications have also been handed to me for four leases of hill ground situated on the south side of Thibert Creek for hydraulic mining on a large scale.

"A short time ago, I had the pleasure of meeting here Mr. Warburton Pike, promoter of the Cassiar Central Railway, and he informed me that it was the intention of the company to commence the construction of the road at the earliest possible date.

"Hitherto, means of communication have been such that considerable time and expense had to be consumed and incurred in reaching this place, and mining men have been attracted to other parts more easy of access; but with a good steamboat service established on the Stickine, a railroad leading across the portage to the head of Dease Lake, with interest aroused by the progress of mining development and the vast field for operations, Cassiar is on the eve of a bright future, and will soon be aroused from her long slumbers into bright activity."

OMINECA.

(A)—"MINERAL WEALTH OF BRITISH COLUMBIA."

Dr. G. M. Dawson, 1888.

"Next in order, on the line of the auriferous axis of the Province, and separated from the last-mentioned region by a considerable interval in which no important gold mining has yet occurred, is the Cariboo District, previously described.

"Still further to the north-westward, along the same belt, beyond an interval in which the Gold Range can scarcely be traced, is the Omineca District, first entered about 1864, but scarcely developed till 1867. This district is situated near the 56th parallel of latitude and is in the drainage basin of Peace River. The area within which the greater part of the mining has taken place is scarcely more than 50 miles in greatest diameter, and includes the upper portions of Germansen, Omineca and Manson Rivers and their tributaries. This area is described as being hilly rather than mountainous, and is nearly everywhere covered by the dense northern forest. A very high opinion was at first formed by miners of the Omineca District, but when the Cassiar discoveries occurred it was nearly abandoned. In 1879 it was re-occupied by about 57 whites and 20 Chinamen, and Vital, Germansen, Manson, Black Jack (a tributary of the last) Slate and Lost Creeks were being worked, but the richer known localities having since been worked over, the mining has gradually dwindled to very small proportions. In 1887 only 12 whites and about 18 Indians are known to have been at work, and the gold produced is estimated at $13,000. Much "coarse" gold was obtained, but the diggings were generally complained of as being "spotted" or irregular. This district is practically the most remote and inaccessible in the Province; the cost of supplies has always been excessive, and the difficulties in the way of enterprise in the form of exploration thus very great A wide area of promising country in this region, therefore, remains untried. The headwaters of Finlay River have always been considered particularly promising from the fact that good 'prospects' of fine gold are found in all the river bars, some of which have paid well for work on them.

"The sources of the Nation River have also been favourably spoken of, and the Misinchinca and other tributaries of the Parsnip present all the appearance of gold-bearing streams, but so far as I know have never been tested. The 'fine' gold which is found and has been mined along the whole upper portion of the Peace River, has doubtless been carried through the mountains by that stream, and is derived from the wide belt of dark, shaly and schistose rocks which runs along the western flanks of the Rocky Mountains in this portion of their length.

"Considerable quantities of arquerite, a silver amalgam, containing about eleven per cent. of mercury, have been found with the gold in scales and nuggets, in Omineca, particularly upon Vital and Silver Creeks. This metal is commonly referred to by the miners as 'silver,' with which its appearance is identical. Very promising deposits of highly argentiferous galena have been found in the vicinity of the placer mines in Omineca, but no attempt has so far been made to work them.

"The miners reached Omineca by two principal routes, viz.: with pack animals, by trail from Quesnelle *via* Stuart Lake, and on foot across the Babine and Fire Pan Mountains from the Forks of the Skeena, the Forks being attained in the first place by ascending the Skeena River from the coast in canoes.

"The gold yield for the first and more prolific years of the Omineca District cannot be ascertained with any completeness, and even since the commencement of the annual Government reports a gap of three years occurs, no returns being given for 1876, 1877 and 1878. During these years, however, the field was virtually almost deserted." The following table is based on the Government reports:—

1874	$38,000
1875	32,040
1876	no returns.
1877	"
1878	"
1879	36,000
1880	45,800
1881	39,300
1882	25,330
1883	21,000
1884	12,000
1885	16,500
1886	17,600
1887	13.000
1888	no returns.

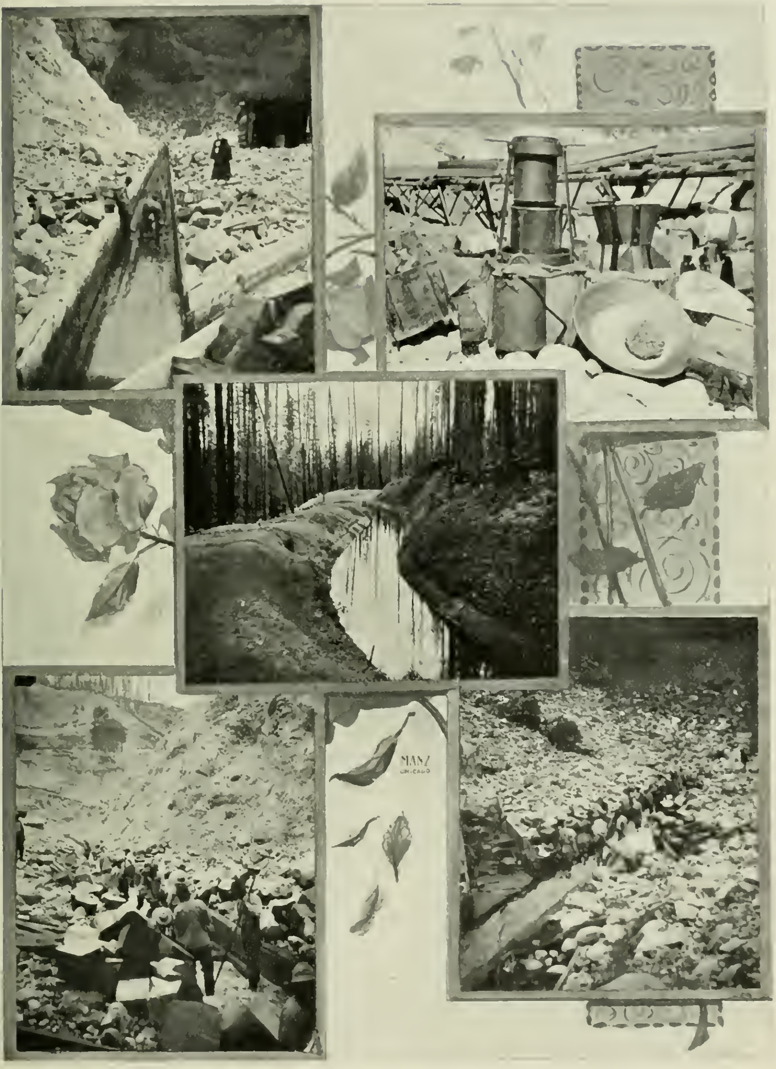
(B)—EXTRACTS FROM REPORT BY R. G. McCONNELL, B.A.Sc.

GEOLOGICAL SURVEY, 1896.

"The Omineca District, embracing the Omineca and Manson Rivers, with their tributaries lies near the 56th parallel, about longitude 125, at the head of the Peace River basin. The actual area from which gold has been taken is perhaps 2,500 square miles. Finlay River receives the Omineca near its mouth, and drains a considerable area to the north. The Omineca lies in Omineca Mining Division, and the Finlay, except a few miles at its mouth, in the Laketon Division.

Routes. "The available routes to this section are two, one by way of Ashcroft and Quesnelle, the other by the coast waters and Skeena River. (*a.*) From Quesnelle passage may be made up the Fraser River to Giscome Portage, 27 miles above Fort George, 110 miles in all from Quesnelle. By Giscome Portage to Summit Lake, down Crooked River, McLeod Lake, Pack and Parsnip Rivers to the mouth of the Finlay, 150 miles. Owing to the difficulties of navigation in ascending the rapid Fraser and descending the shallow Crooked River, the overland route may be taken from Quesnelle to Stuart Lake by trail, and thence to Manson on Manson Creek, a distance of 250 miles from Quesnelle."

To reach the Omineca probably the best trail is now *via* Hazelton, on the Skeena River, across Babine Mountains and Babine and Tatlah Lakes (by ferries), thence to head of Vital Creek, whither a trail leads down to the Omineca River and on to Manson; while another, north of Germansen Lake, runs to Manson near which two companies are now at



VIEWS AT CARIBOO HYDRAULIC MINE, QUESNELLE FORKS, B. C., TAKEN DURING THE "CLEAN UP" OF $62,000, AUGUST, 1897.

work (1897). Old trail from Quesnelle, part of it being the Telegraph Trail, is also open, and much of the supplies for the hydraulic mine has been sent in this way. If the telegraph line is constructed to Dawson City, this old Telegraph Trail, in all probability, will be greatly improved.

Topography. "The most notable feature of the country, in the latitude of the Omineca and Finlay Rivers, or from 55° 30′ N. to 57° N., or beyond, it is universal mountainous character. In this latitude the whole country from the eastern edge of the Rocky Mountains, westward, to the Pacific Ocean, is destitute of plains of any considerable extent, and with the exception of the narrow flats along parts of the principal rivers and lakes, Babine, Tacla, etc., is covered with a succession of mountain and mountain ranges, in height from 3,000 to 5,000 feet above the valleys. In no other part of British Columbia is the country so persistently mountainous across the whole Cordilleran belt. Timber is entirely absent above an altitude of 5,200 feet, or nearly 3,000 feet above Lake Tacla, but below this, dense forests of spruce, pine, fir, with some aspen, balsam and birch, cover the whole country.

Finlay River. "Finlay River, which is in reality the upper portion of the Peace, rises in an irregular mass of mountains north of Tacla Lake, where low passes connect the headwaters of its various branches with the feeders of the Stickine and Skeena Rivers. Flowing in a north-easterly direction at the start through a number of branches, it then turns east and south-eastward, receiving the Thudaca and the Tsetieca Rivers. This part of the river is very rapid and broken till it reaches Long Canyon, below which the current diminishes, and the river becomes navigable 10 or 12 miles below Long Canyon, the Finlay bending eastward breaks through a range of mountains 5,000 to 6,000 feet high, and enters a valley 3 to 6 miles wide, which it flows for a distance of 125 miles, increased a third by its windings to join the Parsnip River. At its entrance to the valley the Finlay receives the Tochieca River from the north and 3 miles below the Inadacha or White Water, well named from the colour caused by the presence of silt derived from the glacier in which this river is said to rise among the Rocky Mountains. For eleven miles the Finlay flows in a nearly straight direction to the mouth of Paul's Branch, a small stream from the north-east. For 35 miles the river now winds through the valley to the mouth of the Akie, bordered in some places by gravel and boulder clay banks up to 25 feet in height. Akie River enters the Finlay in two branches, the larger of which is 100 feet wide; its valley is wide and cuts straight back into the mountains to the north-east for about 12 miles, then bends to the north, but sends a branch to the southward.

"The Finlay now makes a couple of great bends to the east, exposing high cut banks of boulder clay, silt, and gravel, and then passes through Deserter's Canyon, the only serious interruption to navigation between Long Canyon and the mouth. This canyon is about half a mile long, and in the narrowest places scarcely exceeds 100 feet in width. It is cut through hard conglomerate and sandstone, but with low walls generally. The canyon can be run at certain stages of water, but is distinctly dangerous, and can be avoided by means of a portage track half a mile long, cut out by the Indians along the west bank.

"Five miles lower down, the Finlay becomes obstructed by numerous islands and bars, the river being frequently divided into half a dozen different channels. Fourteen miles below Deserter's Canyon, the Ingenica flows in from the south-west. This is a clear, rapid river, 50 to 60 yards wide, and is reported navigable up to the forks, a distance of 30 miles, above which it is filled with rapids. An Indian trail runs up the bank of the Ingenica and crosses the divide to Fort Connelly, on Bear Lake, at the head of the Skeena River, a distance of about 60 miles. Twenty miles below the Ingenica is Fort Grahame, from which another trail goes to Fort Connelly, following a small stream which enters the river opposite Fort Grahame. There is also said to be a trail from here to the Liard River. About 25 miles of unimpeded channel, 200 yards wide, cut through beds of sand, clay and gravel to a depth of 100 feet, in which the river flows at a rate of hardly two miles an hour. The Ospica here flows in from the north by two mouths, each about 100 feet wide. A mile lower down, the Omineca enters with about one-fifth the volume of the Finlay. From this point to its mouth, about 15 miles, the Finlay is again tortuous, and is much broken by gravel bars and islands, attaining an extreme width of 300 yards.

Omineca River. "The Omineca River joins the Finlay from the west, about 15 miles above the junction of the latter with the Parsnip, and is by far its largest tributary. From its mouth to the Black Canyon, a distance of five miles, its course is about 30° south of west. The stream is shallow in this reach, and its current is extremely swift. Numerous gravel bars and islands, covered in places by huge drift piles, obstruct the course of the stream and divide it in places into several channels.

"At the Black Canyon, the Omineca cuts through a ridge of gneiss. The canyon is about half a mile in length, and varies in width from one to two hundred feet. Its walls are usually nearly vertical, and in places exceed 150 feet in height. In low water, the navigation of the canyon is reported to be easy, but in seasons of flood the swollen stream is partly dammed back, and its efforts to force a way through the narrow channel is attended with the production of such whirlpools and billows that its passage with large boats is exceedingly difficult, and with small boats impossible. A trail has been cut along the north bank, by which a portage can be made. The ridge through which the Omineca cuts at the canyon increases rapidly in height to the north, and develops into a mountain range, the peaks of which exceed 5,000 feet in height. Southwards the ridge soon dies away.

"Above the Black Canyon, the valley is closed in for a mile or more by steep cliffs and sandstone, clay, and conglomerates, between which the stream rushes with torrential speed. Farther up, the stream bends to the north-west, and follows parallel to the direction of the mountain ranges of the district, the rocky walls disappear, and the river, freed from confinement, enlarges to twice its former width. Above the bend, the river follows a wide valley between the mountains as far as the mouth of the Tchutetzeca, a distance of 10 miles. The river is here wide and swift, without rapids, but with short and strong riffles every few hundred yards, exceedingly difficult to ascend. Great piles of drift-wood are heaped at all the bends, and on the heads of the numerous bars and islands around which the stream divides. The Tchutetzeca, a rapid stream about 150 feet wide, comes in from the north-west down the same valley occupied by the Omineca above the canyon.

"Above the mouth of the Tchutetzeca, the Omineca leaves the longitudinal valley followed below, and bends to the west. The declivity and current increase, and for some miles the river is a wild torrent plunging in a succession of rapids from bar to bar, making the ascent a matter of extreme difficulty. * * * * Five miles above the Tchutetzeca, the Oslinca comes in from the north. This is the largest tributary of the Omineca, being nearly as large as the main stream. It drains a large area of mountainous country lying between the Omineca and the south branch of the Finlay, which is practically unknown.

"Above the mouth of the Oslinca, the Omineca cuts through a gneissic band, and, for some miles, lofty ranges of mountains press close down to the banks of the river. Six miles above the Oslinca, a contraction of the valley occurs, which is known as the Little Canyon. At this point, the river makes a sharp double bend, strikes with its whole force against two points of gneissic rock which jut out in succession from either bank. The canyon is comparatively easy to ascend, as the tracking line can be used all the way by crossing the stream below the two rocks, but is dangerous to run at high water.

"Above this the current of the river sensibly diminishes. Riffles are still numerous, but they occur at longer intervals, and, with a few exceptions, are of inconsiderable fall. Nine miles above the canyon, quiet water is reached, and paddles can be used for the first time. This is about 35 miles from the mouth of the river, and is 425 feet higher than at that point.

"From the head of the rapid water to Germansen Landing, at the mouth of Germansen Creek, a distance of 12 miles, with the exception of a few small riffles the current is easy, from two to three miles an hour.

"The river has a width of about 100 yards, and for part of the way becomes very tortuous, winding from side to side of the wide flats which now border it. Before reaching Germansen Creek the Omineca turns almost due west, and continues in that direction for many miles.

Germansen.

"Germansen Landing in the old days was a place of considerable importance, as most of the supplies for the Germansen and Manson Creek camps were brought from Tacla Lake across to the Omineca, floated down stream in boats and landed here for distribution. In recent years this route has been abandoned, and such supplies as are needed for the few remaining miners are brought in by pack train.

"An old trail, now in bad repair, runs from the Landing up Germansen Creek, which it crossed in about three miles by a bridge now probably destroyed. About six miles farther up the trail leaves the creek, crosses a bridge 1,300 feet high to the valley of Slate Creek, a branch of Manson on Manson Creek.

"Above the mouth of Germansen Creek the Omineca winds through a wide valley, bottomed in places by marshy flats, behind which appear ranges of high mountains. The current is generally slow for about thirty miles to New Hogem, where it again becomes rapid, and so continues for eight miles to Old Hogem. From this point trail runs to Tacla Lake, by way of Silver Creek, which it follows about six miles past the mouth of the Vital Creek, and turning up Kerney crosses the divide and descends to Tacla Lake. From Tacla Lake to Tom's Creek, a distance of about twenty miles, a comparatively new trail has been built by the Provincial Government. From Tom's Creek to Vital, the trail is little used and is in poor condition.

"Above Old Hogem the Omineca trends to the north-west, the valley is generally narrow, and the river a succession of rapids. The upper waters have been but little explored.

Tacla and Babine Lakes.

"Tacla and Babine Lakes are long, narrow stretches of water separated by the Fire Pan Mountains, lying in valleys parallel with the great valley which is occupied successively by the Finlay, the Parsnip and other rivers to the south, the direction being approximately that of the Rocky Mountains.

"GEOLOGY.

"The geological formations represented in this section show a considerable variety. The west slope of the Rocky Mountains consists largely of gneisses and schists, with some crystalline limestone, diorite and quartzites, the eastern ranges exhibiting bedded limestones. The area of Archaean rock gneisses, schists and crystalline limestone occupies the western side of the Finlay also as far up as the Ingenica, where it bends a little more to the west, and the river flows through shales, and sandstones and conglomerates which occupy the valley, but are not found on the higher levels. The same formation appears to be present in the Tacla Lake valley, and also along the Omineca for a few miles above Black Canyon."

The mountains pierced by the Finlay, where it enters the main valley above the Tochieca, are composed of green volcanic schists, in which some stringers of quartz alternating with bands of yellowish weathering dolomite, are reported by Mr. McConnell. Similar green schists, associated with dry grey argellites and some diabasic tuff, occur along Germansen Creek, and the Omineca from Germansen Landing to New Hogem, and again in the range between Tacla Lake and the Omineca. A small area of conglomerates and sandstones forms the Finlay valley to the west of the schistose range, and is followed by a belt of limestones, with schists and argillites about five miles wide, which apparently extends southward to a distance of sixty miles. A narrow strip of conglomerate, interbedded with some quartzites and schists, and succeeded by the Archaean schists, which confined the valley at its mouth. These are here about six to ten miles wide, and give way to eruptive rocks, consisting of diorite on the border, but passing into granite. Two limestone areas occur on Omineca River, the first part above the Tchutetzeca and the other below Germansen Creek, separated by an area of Archean schists overlain on the west side by fine-grained conglomerate, quartzites and slates.

"Granite is found on Manson Creek and on Omineca River between the two areas of volcanic schists before referred to, and following the river upwards from above New Hogem to the Omineca, Sitelka Pass and beyond as far as explored, a distance of twenty-five miles or more.

Gold Deposits.

"Gold was first found in this neighbourhood in 1861 on the Parsnip, about twenty miles from the mouth, and was successively found on Toy's Bar, on Finlay River, below the Omineca, on Silver Creek, Vital Creek, Germansen, Slate, Manson and Lost Creeks, and on Tom's Creek in 1889.

"The gold in the Omineca region has been obtained principally from the gravels overlying the older rocks in the beds of the present streams. The gravels as a rule have little depth, and the productive portions of the different streams seldom exceed three miles in length. The auriferous gravels underlying the boulder clay on Germansen, Manson and other creeks in the district have a wide distribution and promise favourable results if worked on a sufficiently large scale. Water can be obtained almost anywhere from lakes and mountain streams within a reasonable distance, and the only drawback to successful hydraulicing is the great expense attendant on the carriage of material and supplies from the coast. At the present time the greater part of the supplies are brought in by pack animals from Hazelton, at the Forks of the Skeena, the rate to Manson Creek amounting to seventeen cents per pound.

"Some prospecting has been done in the Omineca region every season since its auriferous character became known, but the district has by no means been thoroughly explored. The discovery of pay gravels on Tom's Creek, close to Vital Creek, twenty years after the latter was found, shows how loose the examination has been. That further discoveries of auriferous creeks will be made admits of little doubt. (Geol. Survey Report, C., 1893.)

"The same remarks apply with perhaps greater force to the Finlay system. Fine gold has been found in small quantities all along the river and at the mouths of its chief branches, the Ingenica, Quadacha and Tocheica; but on Paul's branch, or the neighbouring streams from the Rockies, none of these creeks have been thoroughly prospected, nor has the main river, while a large tract of quite unexplored land lies to the north between the Finlay and the Liard. The bars now known are nearly all virtually worked out, the out-put being estimated at $1,000,000.

Silver.

"Arquerite or silver amalgam has been found to a considerable extent in the placers of Silver and Vital Creeks. Argentiferous galena has been found in strong ledges on Boulder and Lost Creeks.

Present Status.

"Mining in a small way has continued ever since the outset of mining, a few miners remaining in the country after the first excitement subsided, and small quantities of gold have been taken out annually. Recently, however, a good deal of attention has been paid to the district as a prospective large producer by hydraulic methods, and several large companies have been organized, and have secured a number of claims. The Omineca Consolidated Hydraulic Mining Company, Limited, Victoria, is one of these, having a capital of $1,000,000, and commenced operations in 1886 on Manson and Slate Creeks. This company was formed for the purpose of purchasing and operating nine placer claims of 80 acres each, situated on Manson, Black Jack Gulch and Lost Creeks, from which in the early seventies large pay was taken.

"The Caledonia General Mining Association, Victoria, with a capital of $1,500,000, has purchased 640 acres of placer ground on Germansen Creek, and is taking in supplies and machinery.

"An Ottawa Company, the 43rd Mining and Milling Company, has acquired seven claims on Manson and Slate Creeks, and is erecting a saw-mill, and taking in machinery." (Year Book of British Columbia, R. E. Gosnell).

PEACE RIVER.

Peace River is the continuation of Finlay River after its junction with the Parsnip. It flows eastward, close to the 56th parallel of latitude, from the 124th meridian into the North-West Territories, finding its way through Slave and Mackenzie Rivers to the Arctic Ocean.

Routes.

Access to the Peace River may be gained from the east by way of Edmonton and Dunvegan, N. W. T., or from the west *via* Quesnelle.

(*a*.) From Edmonton a waggon road runs north about 80 miles to Athabasca Landing, from which point the Hudson Bay boats go up the Athabasca 50 miles to Little Slave River, and up this to Little Slave Lake. The river is about 40 miles long, very crooked and, in the lower half, shallow and rapid. To the Hudson Bay post near the head of the lake is 65 or 70 miles, the width of the lake being from 2 to 14 miles. This post may also be reached overland from Edmonton by a trail 210 miles in length, and connects with Smoky River Post at the junction of Smoky River with the Peace, by a trail of 65 miles. The ascent of the river may be made by boat or by horse, the distances as given by Dr. Selwyn being as follows:—

Smoky River to Dunvegan	44 miles.
Dunvegan to Fort St. John	70 "
Fort St. John to Hudson's Hope	38 "
Hudson's Hope to head of Canyon by portage Mt. of Rocks	11½ "
Head of Canyon to mouth of Parsnip	75 "

(*b*.) The journey from Quesnelle may be made entirely by water, ascending the Fraser River 110 miles to Giscome Portage, 27 miles above Fort George. A portage of 6 or 7 miles is here necessary to Summit Lake, whence a series of little lakes connected by streams, sometimes rapid, sometimes still, leads to McLeod Lake. Of this portion of the route known as Crooked River Dr. Selwyn writes in his Report, 1876: "In some places the channel was 20 or 30 yards wide, full of large, rounded stones and barely sufficient depth of water to float the boats over them; in others it is still shallower and, for long distances, we had either to walk alongside in the water lifting the boats over the stones or to make a channel by moving the stones or digging out the gravel."

McLeod Lake, 17 miles long with an average width of 2 miles, discharges at Fort McLeod into Pack River, which empties into the Parsnip, 17 miles below.

The arduous ascent of the Fraser River and the difficulties of Giscombe Portage and of Crooked River may be evaded by taking the overland route to Fort McLeod. This route follows the old Telegraph trail from Quesnelle as far as Tsinkut Lake where it branches and runs to Fort St. James on Stuart Lake, 111 miles from Quesnelle; from here to Fort McLeod is about 70 miles. Of this route Dr. Selwyn (Geological Survey Report, 1876), says: "Between Quesnelle and Fort McLeod Lake the trail crosses twelve considerable streams and one narrow arm of a lake, besides a number of brooks from 5 to 20 feet wide; these occur in the following order:—

1. West River flows to right; valley 100 feet deep; descent over sand and gravel terraces 25 feet wide; rapid current.

2. River discharging Pantage Lake runs through wide, swampy flats; joins Westroad River below the lower canyon; 20 to 30 feet wide.

3. Westroad or Blackwater River, 120 feet wide at the ford; wide valley, 360 to 400 feet deep; a good bridge 2 miles below the ford.

4. Chilacco River about 40 yards wide; swift current; fine, grassy flats.

5. Tsinkut Lake River; fine, grassy flats; 30 to 35 yards wide; good bridge.

6. Strong Creek, 25 to 50 feet wide; deep at both banks; wide flats with rich soil and luxuriant grass between this and

7. Nechasco River, south branch, 150 yards wide; strong current of deep water; no bridge or ferry.

8. Nechasco, north branch or Stuart's River, 200 yards wide; ferry; flats along river thickly timbered.

9. 9-Mile Creek, 25 to 30 feet; bridge.

10. Salmon River, west branch, 50 to 60 feet wide; valley narrow, about 150 feet deep; bridge broken, horses have to swim.

11. Swamp Creek, or east branch of Salmon, 30 to 40 feet wide; flats flooded by beaver dams; feed in patches poor and thin. The country between the branches is all sandy and gravelly, in ridges with boggy creeks and small lakes or swampy lagoons.

12. Crossing of Carp Lake, 90 yards wide; horses swim for about 20 yards; the bottom on both sides is fine gravel.

13. Long Lake River, upper crossing 50 to 60 yards wide and rapid current, about four feet deep.

14. Long Lake River, lower crossing at outlet on McLeod's Lake. Between Stuart Lake and Fort McLeod, much of the forest had been burnt; the trail was constantly obstructed by large fallen trees."

Topography.

At the head of Peace River, the country is rugged and mountainous, the general level diminishing with the ascent of Parsnip River. Descending the Peace River, the main range of the Rocky Mountains is pierced, and the mountainous character continues as far as Hudson's Hope. Below this the country consists of more or less undulating plateau 600 or 700 feet above the river, open prairie-like to the north, but heavily wooded on the south side of the river. The climate is exceptionally mild for so high an altitude, and combined with the great fertility of the soil, promises for the Peace River country a great future as a crop producer. Prof. Macoun says of the plateau north of Fort St. John: "For nine miles, the distance travelled, the whole country was covered with the most luxurious vegetation, clumps of willows and poplars of various ages were interspersed with the most astonishing growth of herbaceous plants I ever witnessed. A thick mass of vegetation that averaged from 3 to 5 feet in height. It would be folly to attempt to depict the appearance of the country, as it was so much beyond what I ever saw before, that I dare hardly make use of truthful words to portray it. Rainy River, and the Little Slave Lake marshes are the only regions known to me that are in any way comparable to it. The latter, however, is swamp, while this is a plateau, nearly level, and in parts over 700 feet above the river." Prof. Macoun, quoting from the Hudson's Bay Co.'s journal at Fort St. John, gives the dates of ice breaking on the river from 1866 to 1875, to vary from April 16th to 23rd, and the first ice drifting in the fall from October 31st to November 10th. (Geol. Survey Report, 1876).

Geology.

The following brief notes on the geology of the district, are culled from Dr. Selwyn's report of 1876:—The country generally is overlaid by a thick deposit of drift, or by clay, sand, and gravel beds of Tertiary age, with indications of lignite, underlying large areas in Blackwater valley, and along the Parsnip. Outcrops of fine grained quartzites, shales and slates, occur along the trail from Blackwater to Long Lake River, with some occurrences of diorite apparent. A band of limestone extending north-west and south-east from Fort St. James on Stuart Lake. Descending Pack River and Parsnip River, outcrops are sandy limestones, and limestone schists, shales and conglomerate and black carbonaceous slate, occur opposite Finlay River.

Entering the main range of the Rockies, Mt. Selwyn consists, so far as examined, of a massive reddish quartzite, overlain by grey calc-schists and limestones with clay-slate, which apparently form the main peaks of the range. Beds of sandstone occur at intervals with conglomerate, thin bands of slaty shale and bitumenous coal. Below Hudson Hope are dark argillaceous shales, carrying fossils and associated with sandy calcareous layers, also fossiliferous. Beds of brown sandstone appear in the hill of the river, from which excellent grindstones have been made. Up Pine River the same rock occurs, and in the shale about 50 miles up the river near Table Mountain, Dr. Selwyn reports 4 small seams of bitumenous coal of good quality.

Gold Deposits.

Fine gold has been found in numerous places on the Parsnip and Peace Rivers, frequently in paying quantities. The tributaries cannot be said to have been properly prospected, and little or no work is being done in this section now.

THE LIARD RIVER.

The following account of the Liard River in British Columbia, is taken from Mr. McConnell's Report for the Gelogical Survey, 1889:—

"Rising in the elevated country west of the Rocky Mountains, the Liard falls rapidly towards the east, and is characterized nearly everywhere by impetuous currents, by dangerous rapids and narrow whirlpool-filled canyons. The descent of the river is greatest, and its rapids most numerous while passing through and for some distance on either side of the Rocky Mountains.

"The Liard River was used for a number of years by the Hudson's Bay Co. as a trading route to the Yukon, and a line of posts extending from Fort Simpson, on the Mackenzie, to Fort Selkirk, at the junction of the Lewes and Pelly was established by them, but most of the posts have long been abandoned. The Liard has also been used, to some extent, by prospectors and miners, the discoverers of the Cassiar gold-fields, Messrs. McCollough and Thibert, having ascended it from Fort Simpson to the mouth of the Dease, 1871-72.

"The Liard River, below the mouth of the Dease, has a general width of from 250 to 400 yards, widens out in places to over half a mile, and a current of four miles and a half an hour. It separates in places into a number of channels enclosing low alluvial islands usually well wooded. Its valley is from two to three miles wide, and is shallow with rolling banks, sloping easily up the general level. The country is everywhere well wooded, but the trees are usually small, seldom exceeding a foot in diameter. Twelve miles below the mouth of the Dease, the Liard receives a large tributary from the north. This stream is over a hundred yards wide and is called the Highland River, on the older maps it is named the McPherson River. In the direction from which it comes are some low hills at a distance of four to five miles, behind which appear snowy mountains. From the mouth of Dease River the Liard runs in a general south-east direction for 18 miles and then making a sharp bend to the north, runs for about the same distance in a direction nearly at right angles to its former course. Below the bend the river for 12 miles is wide and filled with islands, after which it gradually decreases in width, and this with the steeper slopes of the valley and the increasing strength of the current, which occasionally breaking into riffles, now hurries along at the rate of seven miles an hour, all afford signs of the approach to the Little Canyon.

Little Canyon.

"The Little Canyon is about half a mile long, and in its narrowest places is about 200 feet wide. It is easily navigable in low water, but is dangerous for small boats during flood, as the channel is very crooked, and the current, striking with great violence against the right hand bank is thrown nearly lengthwise with the direction of the channel making waves large enough to swamp any ordinary river boat which is drawn among them. This canyon can be run with safety by entering it nearly in the middle of the stream, which is as close to the left bank, as the lines of reefs and isolated rocks running out from that will allow, and once past these, making all haste to the left so as to clear the breakers below. In high water the rapid can be avoided by making a portage of about half a mile along the right bank.

"Below the Little Canyon the river widens to over half a mile, and the steep rocky banks are replaced by easier slopes of gravel and sand. These continue for three miles, after which, shales and sandstones reappear in the bank, and their confining influence is immediately seen on the rapid contraction of the stream and the formation of the second narrows. These sudden dilatations and contractions constitute one of the most characteristic features of the Liard, and are an indication of the heterogeneity of the formations through which it cuts. Through the defile just mentioned the stream rushes with great velocity, but with an even current, until near its foot, where it is forced between two points of rock scarcely 100 feet apart, which project into the stream from either bank and determine the formation of two rapidly gyrating and dangerous looking whirlpools. These can be avoided, if necessary, by making a portage of a few feet across one of the points. In ordinary stages of the water, however, they can be run without difficulty.

"At this point the shales, sandstones and conglomerates which have been exposed at intervals, all the way from the mouth of the Dease, are replaced by shaly limestone and soon afterwards by more massive varieties of the same rock.

"Beyond the narrows, the river at once resumes its ordinary dimensions, and rushing rapidly round a short bend enters one of the most picturesque portions of the valley of the Liard. The river averages about 300 yards in width, with a strong even current of about five miles an hour. The valley is everywhere densely wooded with evergreens, aspens, birch and alder, the changing greens of which are agreeably relieved at intervals by grey limestone cliffs, which rise steeply from the water edge.

Porcupine Bar.

"Eight miles below the entrance to this portion of the river is situated Porcupine Bar, once the scene of active mining operations, but now worked out and abandoned. Opposite it is a range of low hills, which extend in an irregular manner for some miles along the left bank of the river; they are composed of limestone, and have an altitude of 1,500 feet above the river or 1,000 feet above the general plateau level. The plateau stretches in all directions, everywhere densely wooded, the principal trees being the white spruce, the black pine, the birch, the rough and smooth barked poplars, the larch, and species of willow and alder; of these the spruce, which attain here a diameter of 15 to 20 inches, is by far the most abundant and valuable.

"From Porcupine Bar the river runs south-east for some miles and then, bending more to the south, preserves a general southerly direction for ten or twelve miles, when it is closed in by a nameless canyon. This canyon is scarcely a hundred yards in length, and is bounded by precipitous limestone cliffs about 150 feet apart. It presents no obstacle to navigation. Immediately below the canyon the river dilates for some distance into a large island-filled basin, beyond which it contracts again to its ordinary width of 300 or 400 yards, and runs with a swift even current in an easterly direction for five miles, when its course is interrupted by the Cranberry Rapids. Two miles above Cranberry rapids the limestones are replaced by shales, sandstones and conglomerates, and a change is immediately noticeable in the character of the stream. The declivity is greatly increased, and for the next 50 miles rapids are of frequent occurrence. The rough water at Cranberry portage has a total length of a mile and a half, but there is a reach of comparatively undisturbed water about half-way down. The upper part of the rapid is exceeding wild, as the bed of the river is filled with huge angular masses of rocks, against which the current breaks with frightful violence. No part of the channel is clear, and portaging is necessary.

"Below the rapids the river hurries on with a smoother surface but with scarcely diminished velocity. It is bordered for some distance by large eddies, between which and the downward current are long lines of dangerous looking whirlpools. Farther down is a long but easily navigable riffle, beyond which, with the exception of an occasional rock, the channel remains comparatively clear until the stream, variously known as Black, Mud, or Turnagain River, is reached.

Turnagain River.

"This stream, although one of the principal affluents of the Liard, is at present almost unknown. It originates near the Finlay Branch of the Peace River, and joins the Liard after a course of about 256 miles. At its mouth it is over 120 yards wide. Eighty miles above its mouth is situated a small trading post, built some years ago by Mr. Rufus Sylvester, but now in possession of the Hudson's Bay Company.

"Mountain Portage Rapids.

"From Mud River the Liard turns more to the north and, still running with great rapidity and breaking into occasional riffles, reaches in a couple of miles the Mountain Portage Rapids, one of the worst rapids on the river. The rapids in the main channel are separated from the left bank by an island, behind which, Mr. McConnell was told, after making a a difficult portage, of a small channel which can be run with comparative safety.

Rabbit River.

"Half a mile below Mountain Portage, Rabbit River comes in from the south. This stream is about 200 feet wide, and brings in a large volume of clear water. At its mouth is a large auriferous bar, which has evidently been worked by placer miners to a considerable extent. Below Rabbit River the channel is clear for a couple of miles, and in the next mile the river alternately narrows in and expands three times and falls over short but strong riffles at each contraction, all of which can be easily avoided, if necessary, by making portages a few yards in length. At the lower narrows three ugly looking whirlpools occur near the left side, and can be passed in safety by keeping to the right bank.

"From Whirlpool Canyon the river flows swiftly around a sharp bend, at the extremity of which it receives Coal River, and after a clear course of less than four miles, plunges over the rapids at Portage Brulé.

Coal River.

"Coal River is a small stream about 100 feet wide, and is interesting on account of the quantity of lignite which it brings down. The lignite is of inferior quality; it is soft, and shows a well-marked woody structure. A walk of several miles up the river failed to reveal its presence *in situ*.

Portage Brulé.

"Portage Brulé is nearly two miles long, and leads across a nearly level wooded flat, which at the upper end of the portage is only elevated a few feet above the surface of the river, but at the lower end is terminated by a sharp descent of over 200 feet. A good track was cut across this portage when mining was being prosecuted on the Liard, and a windlass built at the east end for the purpose of hoisting boats up the steep bank, both of which are still in good condition.

"The rapids at Portage Brulé are about two miles long and are caused by numerous limestone blocks and small islands obstructing the channel. At the lower end the river is narrowly confined by high vertical cliffs.

"RIVER AND COUNTRY BELOW PORTAGE BRULÉ.

"Below Portage Brulé no further obstacles to navigation were encountered until the Devil's Portage was reached. The river is wide and filled with low islands, bars, some of which are auriferous. McCullough's Bar, on which gold in paying quantities was first discovered on the Liard, occurs in this vicinity. The river valley is now lined with rows of terraces rising up to a height of several hundred feet, and clothed in unwooded portions by as luxuriant a growth of grasses and vitches as I have ever seen in any part of the country. Behind the terraces is a gently undulating region occasionally swelling into elevations of from 1,500 feet in height, and everywhere deeply forested, chiefly with white spruce. To the eastward the elevations increase in height and frequency until they merge into the range of the Rocky Mountains.

"Agricultural Prospects.

"This part of the country, judging from the luxuriance of the vegetation and the character of the soil, seems well adapted for agricultural purposes, but the complete absence of climatic statistics renders any positive statements in this connection premature.

Smith River.

"Ten miles below Portage Brulé, Smith River comes in from the north. This is a small stream about 100 feet wide, and appears to originate in a north-westerly spur from the Rocky Mountains, visible in the distance. At ts mouth was situated Fort Halkett, a Hudson's Bay trading post, which has been abandoned

HALL MINES' SMELTER, NELSON, B. C.

BARKERVILLE, CARIBOO, B. C.

since 1865. From Fort Halkett the mountains appear quite close, and the river runs swiftly in a south-east direction straight towards a narrow gap which now appears in their ranks. Before entering this we pass, on the right hand side, the mouth of Rivere des Vents. This river comes from a large lake a few miles south of Fort Halkett, from which the fish supply of the Fort was obtained. It cuts off from the main range a steep-sided massive-looking mountain which I named Mount Ried. . . . The mountains here are narrowed to a single range, and even this, a few miles north of the river, is so reduced in height that it can scarcely be distinguished from the ordinary ridges of the district. To the south the range is much wider and the river seems to skirt the northern extremity of what may be considered the main division of the Rocky Mountain system.

"East of this passage of the Rockies, the mountains gradually recede from the river towards the south, and are replaced by high, rounded, and well-wooded hills and ridges built of dark shales, numerous exposures of which occur all along the banks of the river.

"The river has here an average width of 400 yards, and a steady current of about 1½ miles an hour. It is bordered in places by long gravel and sand benches, and encloses occasional wooded islands. Ten miles east of the gap, Trout River joins the Liard from the south. This is a swift, clear mountain stream about 150 feet wide, which seems to cut back into and drain the central ranges. Below Trout River, the Liard bends abruptly to the north for some distance, and then, turning to the east, continues on with an ever-increasing current between banks which gradually become steeper and higher until they develop into a wide canyon. At the last break in the almost vertical cliffs, and just at the head of a long, easy riffle, traces of the old portage track were found. The river at this point makes a great bend to the north-east, all around which is a succession of rapids and canyons. At the elbow of the bend, a large fall is reported. At the lower end of the bend, the river is reduced to a mere thread, as it is scarcely 150 feet wide, and as fully a third of this is occupied by shore eddies, its bed must be eroded to an enormous depth. Immediately below the contracted part is a large eddy, and the river expands at once to over half a mile in width.

"The Devil's portage is about four miles in length, and passes over a ridge 1,000 feet high, with very steep slopes on both sides, making it an exceptionally difficult portage. Grizzly bears are said to be plentiful in this vicinity, and moose and beaver abound as far as Hell Gate.

"Below the Devil's Portage for 30 or 40 miles, the river flows through what is called the Grand Canyon, but is more correctly a succession of short canyons with expanded basins between, filled with eddying currents. In low water, the whole of this reach can be easily run in almost any kind of boat, but in the season of high floods, the water forcing its way through the throat-like contractions, is thrown into commotion too violent for any but the staunchest boats to stand. Mr. McConnell was at this time using a canvas boat, and was obliged to make a number of short portages, and one over three miles in length. This last was below the Rapids of the Drowned, a very dangerous spot 20 or 30 miles below the Devil's Portage, where the river plunges with its whole force over a ledge of rock, which curves outwards and downwards from the left hand bank, into a boiling chandiere behind. The danger is slight in a good boat by running close to the right bank. Below this comes a large riffle, after which the river is closed in by a hard sandstone bank, through a narrow gap in which it forces with difficulty a stormy passage. In the next four miles the river is closely canyoned in, five times, and falls over a number of riffles. Three miles of the rapid current follows to Hell Gate, so named because it is the entrance from below to this wild portion of the river. At this point there is an abandoned channel on the left hand side, which is navigable in high water, and affords an easy passage through.

"Escaping from Hell Gate Canyon, the river dilates as usual and is bordered by large eddies. Below these it runs swiftly around a large island, and then enters a canyon-like reach about a mile long. The stream here is narrowed down to about 150 yards in width, and flows easily between vertical banks 300 feet high. From this point on, the river has an uninterrupted flow, and presents no obstacles to navigation until near its mouth. Five miles below, the ridgy and hilly foot-hill district is replaced by a region of high irregular plateaus.

"The foot-hills along the Liard have a width of 38 miles, and are characterized by a much greater irregularity in altitude than is usually the case. South of the Devil's Portage, Mount Prudence, a steep-sided reddish looking mountain, rises abruptly from a surrounding of rough topped hills to an estimated height of over 4,000 feet. Going east from Mount Prudence, lower elevations prevail until near the Rapids of the Drowned, where the ridges again commence to increase in elevation, and in a few miles culminate in peaks over 4,000 feet high. Still going east, they gradually diminish in importance, and at last die away and are replaced by flat-topped plateaus. This region, with the exception of the higher peaks, is everywhere densely forested, chiefly with the white spruce, the banksian pine and the aspen.

"After leaving the foot-hill country, the river runs in a general direction of N. 30° E., for 30 miles. In the wider portions the river is usually divided into several channels by islands and bars. The valley is narrow and trough-like, with steep sides rising up in places to a height of fully 1,000 feet. The bottoms are usually small and are here chiefly wooded by members of the poplar family. Some important tributaries are received by the Liard in this portion of its course, among which is Crow River which joins it from the north after entering the plateau country and Toad River which comes in from the south four miles farther down. Two miles below Toad River are the buildings of a deserted Hudson Bay post.

"At the end of this northerly reach, the river, here over a mile wide and filled with islands, bends suddenly at right angles to its former course, and after passing through a narrow gap, enters a much lower country. The steep scarped banks of the plateau district disappear, and are replaced by gently inclined hill-sides covered with forest, while the river spreads out and flows for some miles in a multitude of channels through a bewildering maze of islands. The eastern edge of the plateau district faces eastward with a steep slope, and has a height of over 1,000 feet. It runs nearly due north and south and forms an important feature in the general topography of the country.

Beaver River.

"East of this escarpment Beaver River joins the Liard from the north. This is reported to be a fair sized stream, and to be navigable for canoes for a long distance. It empties into the Liard behind a group of islands, and we passed without seeing it. Near its mouth we saw the first Indians since leaving the mouth of the Dease.

"East of the Beaver the Liard runs in a south-easterly direction for a few miles, and makes a couple of sharp bends before joining the Nelson. Nothing has been published concerning the Nelson, but it is reported to be a somewhat sluggish river about 150 or 200 yards in width. A hundred miles above its mouth is situated Fort Nelson, a Hudson Bay trading post. Above the post the river divides into two branches, one of which, named Buffalo River, turns west to the mountains, while the other continues on and interlocks with tributaries of Hay River.

"In 1872-73 a party of miners crossed from Peace River into the Liard by way of the Nelson on a prospecting trip. They descended Peace River to Half-way River, half-way between Rocky Mountain Portage and Fort St. John, and ascended the latter partly in canoes and partly on the ice for 100 miles. They then made a portage of 25 miles and reached the Nelson, down which they sledded for 60 miles, and then built boats and came the rest of the way by water. They only mention one portage of half a mile, but describe the river as flowing for a long distance above Fort Nelson between lofty banks of sandstone and shale. Colours of gold were obtained on the Liard at the mouth of the Nelson.

"At Fort Nelson some farming is annually done, and potatoes and other vegetables are grown without difficulty. The surrounding country is everywhere well forested, and is reported to produce a better grade of timber than any other part of the Mackenzie District.

"Below the Nelson the Liard has a general northerly direction for 30 miles, and then, bending more to the east, follows a north-east course as far as Fort Liard, 15 miles further down. In this reach it is generally wide and filled with sandbars and wooded islands.

"It is bordered in many places with wide alluvial flats, covered with tall, straight cottonwood and large spruce and canoe birch. Its valley is wide and shallow and lined with gently sloping spruce-clad banks. The greater part of this section seems well adapted for farming purposes.

"The two principal tributaries between the Nelson and Fort Liard are Riviere la Biche and Black River. The former enters from the north-west 20 miles below the Nelson, and the latter from the south-east at Fort Liard. Black River is the outlet of Lake Bis-tcho, and is reported navigable with difficulty throughout its entire course at high water. It will afford, with the Nelson and Hay Rivers, a ready means of entering and exploring the vast block of unknown country lying between the Liard and Peace Rivers, the Mackenzie and the Rocky Mountains."

Geology.

Below the mouth of the Dease Mr. McConnell reports a few exposures of 'soft dark shales associated with friable sandstones and conglomerates,' and at the mouth of the Highland River some 'hard whitish sandstone, passing into quartzite.' The rocks in the Little Canyon consist of dark and sometimes cleared shales, holding large flattened ironstone nodules, hard sandstones and quartzites, and some beds of fine-grained hard silicious conglomerate. They are closely folded together and strike N. 35 W. A few miles below Little Canyon the shales and sandstones give place to limestones, which continue somewhat varied in character to near Cranberry Portage, where shales, sandstones and conglomerates reappear, cut by a series of volcanic dykes. At Whirlpool Canyon are again replaced by a shaly limestone. These rocks are exposed from time to time as far as Portage Brulé, varying from imperfect calc-schists to crystalline limestone.

For ten miles below portage few rock exposures are seen through the glacial deposits of sand and gravel. Soft dark shales crop out at the mouth of Smith River, and can be traced for several miles; where the Rocky Mountains cross the river valley limestones again appear, extending for about six miles, where they are overlain by dark shales, generally rather hard. These persist as far as Hell Gate and beyond, interstratified with sandstone and limestone, the latter generally in thin beds. An anticlinal of an older limestone breaks through the plateau belt east of the foot-hills, 'the banks of the valley are usually scarped, show everywhere extensive sections of flat-lying shales.' These are dark in colour, are soft and finely laminated, and are interstratified with small beds of sandstone and ironstone and layers of ironstone nodules. They are of Cretaceous age, but their mode of junction with the Triassic shales of the foot-hills was not closely ascertained.

Towards the eastern part of the plateau belt the shales along the river are overlain by massive beds of soft sandstone and conglomerate, which form a steep escapement running parallel with the river.

East of the plateau belt few rock exposures appear through the sand and gravel deposits. They consist of dark and sandy shales and sandstones, still of Cretaceous age.

EAST KOOTENAY DISTRICT.

Railroad construction.

During the past year the construction was begun by the C. P. R. of the Crow's Nest Pass Railway from Fort McLeod, in the North West Territories, through the Crow's Nest Pass, in the Rocky Mountains, thence across the valley of the Kootenay River and along the valleys of the Moyie and Goat Rivers to Kootenay Lake to Nelson. The company promises that by this autumn trains will be running over this road as far as Kootenay Lake.

The commencement of this railroad precipitated a great influx of prospectors, speculators, etc., last spring, a large number of whom started into the mountains to prospect, but only to encounter an unusually wet season that deterred a large majority from moving off the trails. Hence, after grub-stakes were gone, many of these at once left the country. But very little advance was made in East Kootenay during the past year, as very few discoveries were reported, and not much work was done on the old claims, as at the "North Star" and "Moyie" groups work was cut down to a limited amount of development pending the coming of the railroad and new conditions and facilities. Perhaps the most important prospecting was done by Captain Petty on Pyramid Creek, a small tributary of the St. Mary's River, which was examined by the writer, and is now reported upon as below.

On Perry Creek, the large ledges of quartz mentioned in the Report for 1896, received a good deal of attention, and Mr. John E. Hardman erected a small stamp mill for testing purposes, but the result of the season's work was that this quartz, so far as prospected and tested, proved to be very low grade and to carry very little gold that could be saved by any free milling process.

From the "North Star" mine about 2,500 tons of ore were shipped to the American smelters, but the unfortunate wreck, on the same day, of two steamers on the Kootenay River, greatly delayed transportation of ore and supplies just at a time when they were most needed. Another and important discovery is reported on this property, but only about 12 men were at work developing.

Prospecting was done on adjacent properties, but work was suspended early in the year on the "Sullivan" group. At the "Moyie" some work was done on the adjacent claims, while on this property itself the ore shute discovered last year has been found to extend down to the lower tunnel.

Coal and Coke.

The great coal fields of the Crow's Nest Pass are now being opened up in two places where the seams of high-grade coking coal are each from 6 to 7 feet thick. The work is in charge of Mr. Blackmore, M.E., who is opening up the properties so as to admit of a large production of coal on the completion of the railway, and is also erecting coke-ovens, so that when the railway reaches the heart of West Kootenay coal and coke can be at once delivered, at greatly reduced prices, at the smelting centres there, the price of coke delivered to be about $6 per ton, the present price varying from $12 to $14.

These fields were examined by Geo. S. Ramsay, M.E., Denver, Colo., who says: "It is my opinion that the Kootenay coal field is the greatest in the Rocky Mountain series. I must say that I know of no coal field in the west where the evidence indicating large tonnage per acre is so prominent as I find it in the Kootenay fields." He also gives the following comparative table:—

STEAM AND COKING COAL.

Mine.	Fixed carbon.	Vol. matter.	Water.	Ash.
Crow's Nest No. 1 (entire vein)	73.04	21.13	2.75	3.08
Crow's Nest No. 2 (lower part of vein)	68.04	19.46	4.04	7.66
Crested Butte, Colorado	56.93	37.23	4.12	5.50
Sunshine, "	56.16	34.22	4.12	5.50

Mr. Ramsay also gives the next table.

COMPARATIVE ANALYSES OF COKE.

Crow's Nest, B. C.	Carbon,	91.97	Ash,	8.03
Crested Butte, Colo	"	89.00	"	11.00
Cardiff and Sunshine, Colo	"	87.13	"	12.82
Belt, Mont. (washed coal)	"	91.00	"	9.00
Connelsville, Penn	"	86.88	"	11.54
Trinidad, Colo. (washed coal)	"	85.00	"	15.00

In East Kootenay, the construction of this railway and the opening of these coal mines will yet be a great influence, as more persistent prospecting will be done on both sides of the valley, up which a railroad may be run to Golden. The country lying between the headwaters of McMurdo Creek south to Toby Creek will be yet more thoroughly prospected, and bodies of low grade reported to be there will receive greater attention when better means of egress to smelters that may be erected much closer home, will encourage a much greater amount of work.

As no reports for 1897 were received at this office from the Gold Commissioner, no information is at hand concerning the progress of hydraulic mining on Wild Horse and other creeks.

St. Mary's River.

About thirty miles up the St. Mary's River to the "Forks" by road and trail from Cranbrook, the intended divisional centre of the Crow's Nest Railroad, a fork of this river flows in from the north, up which, about two miles, a creek known as Copper, or now Pyramid, Creek flows from the north-east. A trail about five miles long, and rising 3,200 feet, leads from the mouth of Pyramid Creek up into a higher basin, whence one of the forks of this creek flows, and in which, at an elevation of 6,800 feet, Captain Petty had established a camp. This country can also be reached from the west by the Government-built trail that starts at Pilot Bay, cr Crawford Bay, Kootenay Lake, passes up Crawford and Hooker Creeks to the summit (elevation

7,200 feet), and then traverses the valleys of the branches of the St. Mary's to the "Forks," and during the past season many travelled from Kootenay Lake to Fort Steele over this trail

The mountains in this part of East Kootenay belong to the Purcell Range, and from any lofty elevation can be seen a far-stretching sea of lofty, sharp-crested summits, with deep, heavily-wooded valleys. Geologically these mountains comprise well-stratified quartzite slates, shales, and silicious limestones overlying, apparently, schists and gneisses, and broken through by areas of eruptive rock, from which intrusive sheets lie as if interbedded with the sedimentary rocks.

These bedded rocks have been tilted up to angles of 20 to 45 degrees, forming sharp-pointed ridges, and on the summits and along the steep sides of mountains surrounding this basin Capt. Petty had about 25 men engaged prospecting and opening up a number of claims located by his prospectors, and on which such as those examined, the "Warren," "Wolmer," "Brooks," "Kerrin," "Comstock," "Bailey," "Walsingham," "Albert," "Milton," "Stella," and others not visited, a variety of ores was being disclosed as work proceeded, gold-bearing copper ore in some of the veins, silver-lead in others, and, while the veins so far developed were small in size, some fine samples of ore had been got in this preliminary work. Nearly all the veins seen had a strike of N. 60° W. and a dip N. 30° E., or were vertical. They traverse both the stratified and the eruptive rocks, but none had been traced for any distance, or for more than a few hundred feet, although the surface is pretty well bared. Prospect work had just begun, and it was then too early to learn or decide what these veins or ledges would prove to be in size or value when work had been pushed well underground.

The camp was located near a small clump of trees that marked the extreme timber line which here lies at 7,000 feet, and by a good stream of water, and at the head of the basin was an encircling summit, elevation about 8,500 feet, beyond which to the north, locations had been made on both copper and silver-lead leads, whose dimensions and continuity were reported to be very promising. Work was being begun on some of these claims, and if this is proceeded with on a large scale during the coming season, it is said a road can easily be constructed up to these discoveries from the St. Mary's, by following up Split or John Creek, which flows into this river 10 miles east of the "Forks."

On the claims about the basin at the camp on Pyramid Creek, sufficient work was being done so that Crown Grants could be at once applied for, and should the existence of shipping ore in sufficient quantity be demonstrated on these claims to be described, transport will have to be provided by means of aerial tramways, now so successfully used in many mountainous districts. Of course at such elevations as those found at these claims, in winter there will be a great depth of snow, which will not interfere with mining after proper accommodations are supplied, and under-ground work is well advanced. While work on these claims at time of visit had not proceeded far, it is understood that Captain Petty will, during the season of 1898, continue the work on a much more extended plan, having received in the results of past season's work, the encouragement to do so. The following claims were examined.

WARREN.

Elevation 7,700 feet above sea-level by pocket aneroid. On this claim at the head of the basin a tunnel had just been begun on a vein, strike N. 30° W., dip S. 60° W. 50°, of hackly, white quartz, 12 to 15 feet wide. The vein was much decomposed by the oxidation of the mispickle or arsenical iron, but a small amount of coarse cubed galena was in evidence. Further up the hill this vein running in a very schistose slate, was 4 to 5 feet wide before it disappeared under the débris, but a few feet easterly was a very large exposure 20 to 30 feet wide at one place, of reddish weathering-white quartz almost perfectly barren of sulphides, which had not then been tested.

WOLMER.

Elevation, 7,800. This claim lies immediately north of the "Warren," the quartz-mispickel vein above mentioned passing into it, and 200 feet from the "Warren" tunnel a small test-pit was sunk 15 feet on a small quartz vein, carrying a considerable amount of galena, with some mispickel and zinc blende. On the surface there were 12 inches of good lead ore, and at the bottom nearly 2 feet, while on the dump were two tons of ore, the assay values of which had not then been determined. This vein is said to be traceable up the steep mountain side rising near here, but with work just begun, not more could be seen on these two claims which lie above snow line.

BROOKS.

Elevation, 7,900 feet. On the steep bluff west of the camp, and along the sharp ridge running southerly from the "Wolmer," was a large exposure of barren-looking, crushed quartz, apparently lying conformable with the inclosing slates and quartzites. In a 10-foot hole were seen 3 feet of quartz, with stringers running into the foot-wall, but no values had been found, and this vein could not be traced beyond the small bluff.

KERRIN, COMSTOCK, ET AL.

Along the same ridge but about three-fourths of a mile south of the "Brooks," was another group of claims located along a very precipitous rocky mountain side, on which the "Kerrin," "Comstock," "Bailey" and "Walsingham," were examined. At this point was a large entrusive interbedded sheet of fine-grained dioritic rock, which is found *en masse* in the basin of the camp, and to comprise large intrusive sheets interstratified in the bluffs, rising on the other or eastern side of the camp.

Kerrin—Altitude 6,550. Near the west side line, and 150 feet east of the "Comstock" shaft ; a tunnel was in 10 feet, in the face of a bluff, on a vein of milky-white quartz, 2 to 4 feet wide, changing to a resin-coloured quartz with calcite and a small amount of copper pyrites, of which material no assays had been then made.

Comstock—Altitude 6,600. The same vein enters this property; strike, N. 60° W. ; dip, N. 30°, E. 70°, but where work was being done, had passed out of the eruptive into the stratified or quartzitic rock. Very little was showing on the surface, but a small shaft was being sunk on a small decomposed vein, which, at 15 feet had widened to 15 and 20 inches of galena, chalcopyrite and pyrrhotite in a quartz-calcite gangue, yielding samples of very fine looking ore of which no assay values were then known. No efforts had been made to further trace this vein. Since time of visit, at 27 feet, the vein, after narrowing to nothing, has widened to 5 feet.

Bailey—Altitude, 5,900. Lower down the bluff, and to the west of the "Comstock," in the dioritic rock, was another vein of reddish-brown quartz carrying a very little copper pyrites, in which was a 15-foot tunnel and a 10-foot shaft, showing the vein to be 2 to 4 feet wide, but much broken up at the surface. At the time of visit, the shaft was being timbered with the intention of rigging up a windless, and then sinking to some depth to learn the conditions where the formation was solid and regular. On the

Walsingham—Altitude 5,950. Lying east of the "Bailey" and south of the "Comstock," work was in progress on a small vein of calcite 18 to 30 inches wide, in the eruptive rock, in which some copper pyrites were found near the surface, but none below the small test shaft, 15 feet deep, that had been sunk partly in the lime and partly in a streak, 2 feet wide of black loamy material, which evidently had been washed in where the easily corroded calcite had been eaten away and removed.

ALBERT, MILTON, STELLA.

On the opposite bluff, or to the east of the basin, prospecting was being done on several claims, on which the veins, though as yet small in size, yet carried copper sulphides, and in one, beautiful samples of metallic copper in quartz, but of such the amount was very limited.

Albert—Altitude 7,000. A shaft was down 15 feet in ground, at the surface badly shattered, along a four-foot vein of reddish-brown quartz and calcite, carrying a small percentage of yellow copper sulphides. Along these bluffs the eruptive rock is apparently lying both intercalated with the quartzites and also cutting across them. This vein had not been traced for but it is seen to have a strong outcrop for over 100 feet.

Milton—Altitude 7,900. North of the "Albert," along the very steep mountain side. Here a vein of calcite and very white quartz, 2 to 6 feet wide, can be traced on the surface for about 50 feet, beyond which only quartz stringers are seen. A tunnel was then in 20 feet and while more sulphides and some metallic copper were found near the mouth, afterwards only a small amount of yellow copper came in along one wall.

Stella—Altitude 7,650. A small quartz vein, 8 to 16 inches wide, in this same eruptive rock was being prospected by a tunnel, 3 by 5 feet, showing again the yellow copper sulphides, but 1,000 feet north on the same claim, a ledge of galena and mispickel had been found almost directly opposite that one found across on the other side of the basin on the "Warren" and on which some work was being done.

OTHER CLAIMS.

To the west and north other locations had been made on copper and lead ledges, and a strong galena vein was reported as easily traceable through four claims, but as time for inspection was limited, no more prospects were visited, although prospectors were here and there staking claims over a considerable extent of country.

WEST KOOTENAY DISTRICT.

AINSWORTH DIVISION.

There has been increased activity here during the past year, but still many properties are lying idle. Again the fall in silver proved disastrous, as money becoming interested here to a great extent withdrew.

No. One. Mr. L. Shaw has maintained the out-put of this mine, and high grade concentrates are being shipped.

Tariff. The incline has reached a depth of nearly 300 feet, and considerable water has to be handled. Braden Bros. are shipping the ore to their concentrator at Pilot Bay.

The *Highlander.* An aerial tramway and concentrator were put in for this property, but little or no ore has been taken out.

The *Black Diamond* is shipping ore over this tramway to this mill and getting a very good product, but no work is being done on the *Little Phil.*

The *Highland* is still prospecting, but shipping no ore.

The *Skyline* and *Neosha* are shut down.

The *Canadian Pacific Milling Co.*, at the mouth of Woodbury Creek, after installing a fine water-power and concentrator, were shortly afterwards forced to shut down for lack of ore.

TAYLOR AIR-COMPRESSOR PLANT.

At the mouth of Krao Creek, and using the water of Coffee Creek near the town of Ainsworth, Mr. Norman is installing for the Kootenay Air Supply Company a Taylor air-compressor plant, by which it is expected to generate about 500 h. p., and to transmit this air in a 9-inch main under 90 lbs. pressure to the mines, where branch lines can be diverted.

This system is very interesting, and is giving great satisfaction at Sherbrook, P. Q. The principle is as follows:—A shaft will be sunk 200 feet down, which will pass a wooden stave pipe to a bell or air trap. The top of this pipe will be about 19 feet above the top of the shaft, so that water flowing down sucks down many bubbles of air, which are trapped in the bell and led thence by the air-pipe to the main. the pressure depending upon the depth of the shaft. Hence once installed very little more is required, as the water and air flowing down this pipe maintains a steady supply of wonderfully dry air. This method of compressing air is patented.

SOUTH FORK OF KASLO.

The *Montezuma* has developed a large body of zinc-galena concentrating ore, and a concentrator has been erected by Mr. T. L. Mitchel, who will operate it. The *Gibson*, on Cariboo Creek, is now shipping silver-lead ore, while on the *Silver Bell*, nine miles up the South Fork, ore has been found from which a shipment will soon be made.

KASLO CREEK.

Whitewater Mine.

This mine has shipped much more extensively during the past year, and very heavy shipments are being made this winter. Contiguous properties are being prospected, one by Mr. J. E. Boss, who is driving a long tunnel to tap the "Whitewater" vein. The "Whitewater," up to January 1st, 1898, had paid $123,000 in dividends, or $87,000 in 1897.

The *Charleston.* Mr. Mitchell has stuck manfully to this property, and has met his well deserved reward by disclosing, 300 feet in his lowest tunnel, a fine body of high grade ore, along which, at last account, the drift had run for 12 feet, leaving a body of ore nearly 4 feet wide, from which an average sample is stated to have run 720 ounces in silver. A shipment is now being made.

The *Ibex* came to grief during the summer, and the affairs of this company have been wound up.

Up in Jackson Basin work has been discontinued, for a time at least, on the *Northern Belle*, or as known as the *Jackson Mine.* Capt. R. C. Adams has been driving a long tunnel to explore the *Bon-Ton* claim.

The *Eureka*, north of Kaslo Creek, under the charge of Mr. J. C. Ryan, is shipping two to three carloads a month of silver-lead ore.

DUNCAN RIVER.

Much prospecting was done during the past season in this region, resulting in the discovery of silver-lead ores up in the same formations as found in the Trout Lake District, the great up-tilted belt of lime extending down this far.

On the *Levinah* group, between Glacier and Grizzly Creeks, east of the Duncan River, a good body of galena ore, running 50 ozs. in silver, is reported to have been found near the "lime dike," and a small body of men is at work.

The Dominion Government has instructed their engineer for the Province, Mr. Roy, to examine the Duncan River as to the possibility of opening it up for navigation by small steamers.

THE TOWN OF KASLO.

This town had a return of prosperity during this season, and many new buildings were put up, but at the present time trade is very quiet, as the tide of transient strangers has greatly decreased, and men are saving up for the Klondike.

PILOT BAY SMELTER AND CONCENTRATOR.

These works have passed into the control of Braden Bros, who are using the concentrator only for ore from their properties, the "Tariff," "Lucky Jim," etc., but it is understood that there is no intention of blowing in the furnace for some time at least.

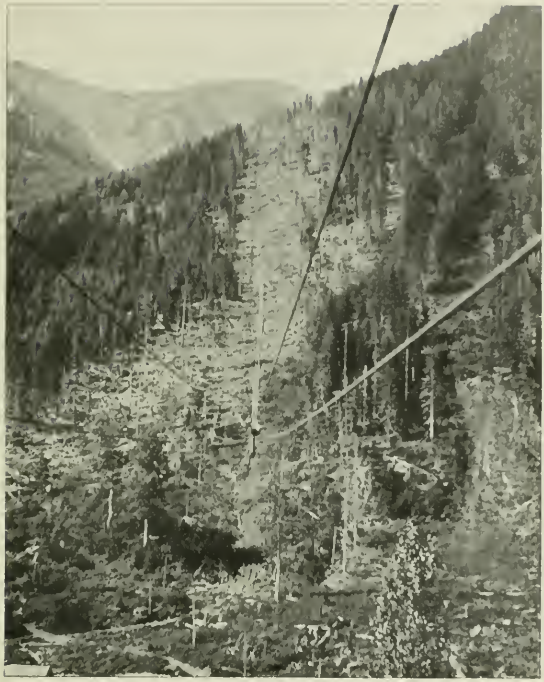
ILLECILLEWAET DIVISION.

Lanark. This was the only mine visited in this Division. Unfortunately, it has so far proved to be very disappointing to the Lillooet, Fraser River and Cariboo Gold Fields, Ltd., as the amount and value of the ore reported to be in sight to the company, has since proved to be utterly at variance with the results obtained in the mining and milling of this ore-body. The management of this mine incurred a large and premature expenditure by the hurried erection of a concentrating mill, tramway and expensive buildings before the mine had been developed enough to warrant this out-lay. So necessary, for various reasons, were these buildings considered that they were erected in midwinter at a far greater cost than would have been required later.

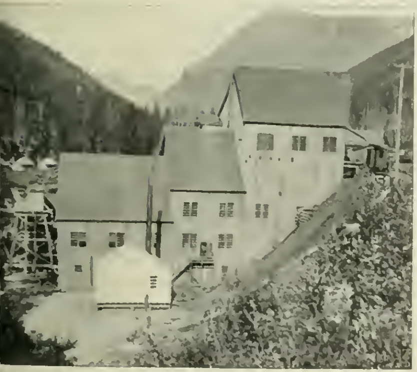
At this mine the first tenet of good mining was disregarded in that, instead of commencing on a vigorous plan of development and search for other ore-shutes, a large gang of men was set to work to stope out all the ore in sight, which they did with the consequence that when this ore-body was exhausted and nothing had been done to look for more, work came to a stand-still.

A very full account, taken from the company's statements, was in the Report of the Minister of Mines for 1896, which need not be repeated in this.

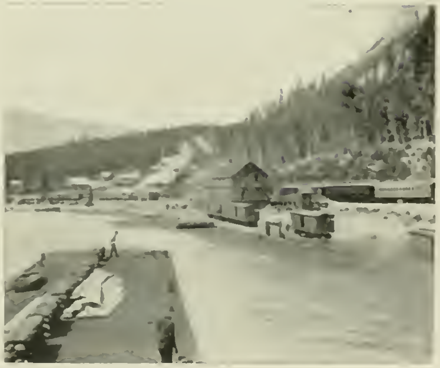
The most important ore-body was found on the "Lanark" claim in this group that lies about 1.5 miles north and 2,500 feet above the small station of Laurie, on the main line of the C.P.R., a few miles east of Revelstoke. The very precipitous mountains of the Selkirk Range here consist of steeply tilted, contorted carbonaceous schists interbedded with narrow



ONE SPAN, OTTO TRAMWAY, LANARK MINE.



CONCENTRATOR, LANARK MINE.



ARROWHEAD, WEST KOOTENAY. MATTE FROM HALL MINES TO SWANSEA SHOWING ON THE BARGE.

bands of limestone, similar to the formations found further south in the Trout Lake Division. Little or no eruptive rock, as dykes, etc., were seen near this mine, but the ore body was found to occur in a body of shattered limestone and to be apparently conformable with the enclosing schists.

This ore-body was discovered by short drifts run in near its apex where its greatest width of ore, or 20 to 25 feet, was encountered, then a long tunnel was driven lower down the mountain side striking this body at about the 400-foot level. From this level all ore has been stoped out up to the surface and, as to the dimensions of the shute, the thickness decreased from 15 to 25 feet in the upper workings to 4 and 5 feet in the lowest, with an average width of 7 feet, while its length, or along the strike, was from 50 to 100 feet with 65 on the 400-foot level.

The ore consisted of argentiferous galena and barren iron pyrites in a gangue of quartz and limestone, and while a considerable amount of nearly solid ore was found, yet the sulphides were scattered in very irregular proportions throughout the mass, and little or no attempt was made at the mine to hand sort, but everything was sent down to the mill. The straight or clean galena ore was evidently not very high-grade in silver as the concentrates ran from 57.5 to 64 ounces in silver per ton and 66 to 72 lead.

Considerable work had been done in former years on other claims in this group, notably on the "Maple Leaf," and considerable mixed ore, but no well-defined ore-shute had been found. At present only three or four men are at work doing some development which will and should be done much more extensively after the snow leaves these mountains in the spring.

Equipment. The Otto wire rope tramway with two spans, each over 2,000 feet long in the clear, a total length of 6,550 feet, and difference in elevation between terminals of 2,640 feet, capacity, 100 tons in 10 hours, gave excellent satisfaction, and the cost of tramming down the ore to the mill was about 30 cents per ton.

The concentrator was erected at the track of the C.P.R., and the necessary power was got by throwing a dam across the Illecillewaet River and building 3,000 feet of fluming. An electric power and lighting plant was also installed. The future of the property now depends upon the results of extensive developing and prospecting that will now have to be done, and should shutes of good ore be found, then every facility for its convenient transport and milling will be at hand, but the company has not announced the policy it proposes to follow.

REVELSTOKE DIVISION.

As this division was not examined and no reports were sent in by the Government officers, no information is available for this Report of the progress of mining and prospecting.

NELSON DIVISION.

The Town of Nelson has grown very rapidly during the past year, many new buildings having been erected, as, from its location on the lake and on the different lines of railroad, it must always be an important and central point. Considerable development has been in progress throughout the district, with good results, as at the "Ymir," "Porto Rico," "Fern," "Dundee," "Athabasca," etc., and several other claims are said to now promise well. Not much was done on the "Poorman" or the adjoining properties. The writer visited no mines in this district during the year.

The Hall Mines, Ltd.

This mine was not seen this year, but the production of ore has been well sustained throughout nearly all the year. Mr. Croasdaile, General Manager, reports that a new ore body has been found, that is now thought to be at least 300 feet long, 12 feet wide, and to average nearly 50 ounces in silver per ton. The Hallidie tramway, probably the severest of its type ever erected, is working very well, and automatic loading devices are being attempted.

At the smelter, Mr. R. R. Hedley took charge on the resignation of Mr. Paul Johnson, a , besides doing excellent work, has made some very important alterations and additions in the refinery, where there are now two roasters 18 by 50 feet, and two reverberatory furnaces 12 by 18 feet, for calcining and refining to a product of 98 % copper, which is sent to Balbach's refinery, Newark, N. J.

Mr. Johnson designed and erected what is probably one of the largest copper blast furnaces in existence, or 44 by 144 inches at the tuyeres, and Mr. Hedley says that it is giving every satisfaction, despite the low percentage of copper in the charge. The former copper stack has been converted into a lead furnace 42 by 100 inches, and before long the smelting of Slocan lead ores will be attempted here, although further roasting plant may be requisite. In the Engineering and Mining Journal, December 11th, 1897, Mr. Hedley has the following interesting article on—

MATTE SMELTING AT THE HALL MINES.

"The matte smelting blast furnace in use at the works connected with the Hall Mines in British Columbia is probably the largest furnace of its kind in North America, which is equivalent to saying in the world. It has now been in blast sufficiently long to demonstrate its capabilities, and the following description will be undoubtedly of interest:—

"The furnace was blown in September 5th, and had worked to November 5th, the day of writing, 60 days. During that time, it smelted 14,676 tons of charge, of which 1,587 tons was barren flux, chiefly limestone. This shows an average of 244.9 tons smelted daily. Under favourable circumstances, it is possible to smelt 300 tons per day, as proven by the 24 hours ending 6 a.m. November 5th, the actual tonnage passed through the furnace being 273.9 tons ore and 30.1 tons limestone, and again, on October 30th, 277.2 tons of Silver King ore and 30.8 tons of limestone. The average tonnage for the seven days ending November 5th was 282.5 of charge. In addition to this, note may be taken of the fact that 200 lbs. of slag are added to every ton of charge.

"The percentage of coke varies between 14½ and 16 %, according to the quality of the coke and the amount of sulphur in the charge.

"The matte produced during the period of 60 days mentioned was 1,029 tons, averaging about 49 % copper, wet assay. The concentration is about 14.25 parts of charge into one of matte, but the furnace has run successfully with a concentration of 20 to 1. A great point in favour of this furnace is that it will handle a very large proportion of fine ore.

"The character of the ore is chalcopyrite, bornite, tetrahedrite, and kindred minerals in a variable gangue, which gives an average composition of silica, 33 %; ferrous oxide, 9.5 %; manganese oxide, 8 %; lime, 7.5 %; magnesia, 4 %; alumina, 15 %; copper, 4 %; sulphur, 3.2 %. Limestone, the only flux generally used, carries 10 % silica, and the resultant slag has a composition of silica, 43 %; lime, 15 %; ferrous oxide, 12 %; manganese oxide, 9 %; alumina, 18 %. Slags have averaged for two months 0.345 % copper and 1.15 silver per ton.

"This furnace was designed and erected by Mr. Paul Johnson, late superintendent of the works. Its dimensions are: At tuyeres, 144 in. by 44 in.; at top of jackets, which are 5 feet 6 inches high, 144 in. by 64 in.; and at feed-floor, 160 in. by 72 in. The top height of the columns is 12 ft. 6 in., but the charge is generally maintained 4 ft. lower, varying, however, with conditions of charge, etc. The tuyeres, eight in number on each side, are reduced from 6 in. to 4¾ in.; the centre of the tuyere is 24 in. above the bottom, as originally constructed. The bottom is supported by a cast-iron plate, resting on six jack-screws carried by a truck, and consists of a coil of 2-in. water pipe bedded in steep (brasque), and a course of fire-brick on end. On this the furnace makes its own bottom, which probably is now about 4 in. higher.

"Provision is made for tapping on the side, but the end tap only is used. The flow is practically continuous, separation being made in a large conical pot of special manufacture. A second settler is used, of similar form but smaller, and thence the slag flows into a powerful stream of water. It would be interesting to know if there are other furnaces in service that have dimensions similar to this, and what their capacity is."

Production. During the past year, to December 31st, 47,560 tons of "Silver King" ore have been smelted, *yielding* 954,585 ounces of silver and 3,453,644 lbs. of copper, and a little gold. Hence the average *yield* of the ore for the year per 2,000 lbs. has been 20.7 ounces of silver, .04 ounces of gold, and 3.63 % copper, or $16.81 per ton.

Dividends. While guaranteed dividends of seven per cent. have been paid on the preference shares, the first dividend of ten per cent. upon the ordinary stock was declared, or a total dividend of $133,750 for 1897, or $160,000 in all to date.

The Fern Mine.

This company, during the past season, erected a 10-stamp mill and built a 3-rail gravity tramway down from the mine. Since the stamps began to drop, there have been two clean-ups, yielding $28,500 at a cost of $12,000 in three months, and from the second clean-up, after crushing in 44 days 1,251 tons, the yield per ton was $7.70 caught on the plates, and $1.55 in the concentrates, or $9.25. Besides this mill-rock, some ore is sorted out and sent to the smelter at Nelson. Development work is progressing, and it is the intention of the management to enlarge the plant, and perhaps to add a cyanide plant, as the work is reported to be showing up a fast-increasing amount of ore. A dividend of $10,000 has been declared.

Athabasca.

On Toad Mountain, this property is being developed, and during the year several shipments of ore were sent down to the smelter *via* the Hall Mines Tramway; ore that ran from 1.2 to 5.2 ounces in gold per ton and 4 to 7 ounces silver, or an average of 3.3 ounces of gold and 5 ounces of silver per ton.

Ymir.

This group, on the North Fork of Wild Horse Creek, is being extensively developed by the London and B. C. Gold Fields Co., Limited, under the direction of Mr. S. S. Fowler, M.E. A waggon road has been built from Ymir Station on the N. and F. S. R.R., to the mine, where nearly 2,500 feet of work have been done, and a large body of good ore carrying, in quartz and galena, pyrites and blend, both silver and gold value, has been found. The mine is being thoroughly opened up, while in the meantime the method of treatment best suited to this ore is being carefully studied.

Porto Rico.

The Canadian Pacific Exploration Co., Lt'd., Eng., is opening up this property on the North Fork of Salmon River. A road seven miles long has been built from the N. and F. S. R.R., and three tunnels on the vein, now aggregate 700 feet of work. Good buildings have been erected. A shipment of 41 tons was recently made to the smelter at Trail, which is reported to have yielded $76.25 per ton in gold. This Company is also developing the *California* on Toad Mountain, where the mine is said to be looking very well.

Other Claims.

Dundee is being opened up on a lead of silver-gold ore, and about 14 men are at work; while near Ymir the following are said to be working:—The *Wilcox*, with 10 men; the *Porcupine*, with 8 men; the *New Brunswick*, with 8 men; the *Union Jack*, with 4 men; the *Jubilee*, with 10 men; the *Roanoke*, with 3, and the *Tamarac*, with 10.

SLOCAN DIVISION.

During the past year this Division was sub divided into three recording divisions, but in this report the term "Slocan" will refer to the territory within the old boundaries. Unwittingly, in Bulletin No. 3, several mines as the "Whitewater," "Washington," "Northern Belle," etc., were spoken of as being in the Slocan, instead of in the Ainsworth Division.

Production of Mines.

The following tables give the *net smelter returns* of ore from the Slocan District sold during the years of 1896-7. The tonnage is the dry weight of the crude ore and concentrates shipped, *i.e.*, with the moisture deducted. The silver and gold values represent 95 % of the asssay values, and the lead 90 %, as the smelters do not pay for the balance.

The average market values at New York have been taken, or for silver for 1896, 67 cents, and for 1897, 59.8 cents per ounce. For lead for 1896, $2.98 per 100 lbs., for 1897, $3.58.

NET PRODUCTION PER SMELTER RETURNS.

Years.	Tons. 2,000 lbs.	Silver, Oz.	Lead, lbs.	Gold, Oz.	Values.
1895	9,514	1,122.770	9,666,324	6	$1,045,600
1896	16,560	1,954,258	18,175,074	152	1,854,011
1897	33,576	3,641,287	30,707,705	193	3,280,686
Totals	59,650	6,728,315	58,579,103	351	$6,180,297

ACTUAL YIELD VALUES PER TON.

Years.	Silver.	Lead.	Value.
1895	118.0 oz.	50.8 %	$109 90
1896	118.0 "	54.9 "	111 95
1897	108.5 "	45.7 "	97 71
For 59,650 tons	111.12 oz.	49.1 %	$103 60

Dividends. The actual amount paid in dividends cannot be stated, as some of the mines never make their profits public, such as the now famous "Payne," but it is known that the total amount is at least $1,800,000, of which $960,000 were paid in 1897. The following mines have stated publicly their dividends:—"Slocan Star," $400,000; "Reco," $287,500; "Idaho," $220,000; "Rambler-Cariboo," $40,000; "Goodenough," $32,500; "Last Chance," $37,000.

Progress of Mining. In the autumn of 1896 and the winter of 1897, the silver mines of the Slocan attracted unusual attention, as the great money making possibilities of very high-grade silver-lead veins became apparent. A real boom was inaugurated, the different towns built up rapidly as many people crowded in, but in July the sudden drop in the price of silver checked all speculation and the boom was over.

The increased out-put of the Slocan for 1897 speaks for itself, while the record of some of its mines during the past year attracts much attention. One significant feature during the year has been that despite the fact that gold is the favourite and silver has fewer friends, several of the larger and developed properties have passed under the control of British capital, and others are being examined with a view to purchase, the fact being realised that this high-grade Slocan silver-lead ore is exceedingly profitable, and yielding handsome dividends.

No new properties attained special prominence during the year, but several of the older claims forged ahead and became heavy shippers, such as the "Payne," "Ruth" and "Whitewater," and several, such as the "Queen Bess," "Charleston," "Ivanhoe," "Last Chance," etc., are reported to have good ore shutes now in sight, but no mines were visited by the writer during the past season. First, but small, shipments were made from quite a number of new claims, development work is progressing in many places, and remembering how every good property in the Slocan had very insignificant surface prospects, it is impossible to tell when a good ore-shute of this high-grade ore may be struck, and a mine hitherto little known suddenly spring into prominence.

Many prospectors and miners are preparing to join the great rush northward to the gold fields, and their unusual economy is being felt in all the towns, but this hegira will not be an unmixed evil, as the prices asked for prospects are already falling rapidly, and in all probability in spite of quieter times, more and better development work will be done, as it will be found that many, if not more purchasers will be now in search of good properties.

Railroads. Since last report the C. P. R. has built and opened its branch line from Slocan City to Slocan Crossing on the Nelson and Robson line, and a large new steamer runs twice daily from Slocan City to Roseberry, where it connects with the Nakusp and Sandon branch. The K. and S. R. is considering the extension of this line northward from Kaslo and up the Duncan River, to open up that large section of country.

Smelting. Little or no reduction in freight and treatment charges has been obtained, the charges running from $20.50 to $22 per ton. The American smelters are eager to get this ore and those to the south, as in Colorado, charge $1 50 to $3 per ton smelting charges on the net weight (*i. e.* less moisture) and $19 a gross ton for freight. This is a flat rate, that is, no account is taken of silica or iron contents, only excess of zinc or over 10 %, and in some contracts 12 %, being paid for at fifty cents per unit. Of course the smelters of shorter haul, as on Puget Sound, charge higher smelting rates to make up the difference in lower freights.

Silver is paid for at New York price at time of settlement for 95 % of assay value, and *lead* also up to 90 % of assay value.

The *duty* is 1.5 cents on every pound of lead in the ore as exported to the United States, although the smelter only pays the miner for ninety per cent. The ore is shipped in bond to the smelter, where the smelter men pay the duty, after sampling, to the United States Government out of the value of the ore, or else they retain this duty charge, and ship refined lead to Europe when the prices there, always lower than in the United States, are such as to admit of a margin of profit by adding the amount of the duty to their selling price. Hence the mine-owner always pays this duty charge on lead.

The Province levies a tax of 1 per cent. on the value of the ore after deducting freight and treatment charges. Hence the average ore for 1897 *yielding* 108.5 ozs. silver and 45.7 per cent. lead, at the average prices for 1897, would be worth $97.70 per ton, from which have to be deducted:

Freight and treatment...	$22 00
Duty on lead (100 %)	15 25
Government tax	75
	$38 00

Besides the cost of mining, sacking and transport to point of shipment, so that the net value or profit on *average* Slocan ore will be about $50 to $55 per ton.

Sampling Works are running at Kaslo, and it is proposed to put such a plant at Roseberry for ores going out on the C.P.R. Nearly all the larger mines ship direct to the smelter, some sending alternative lots to different smelters. The price of sampling is $1.50 per ton, and the sampler is prepared to buy the ore outright after sampling.

Transportation. The ore is shipped in sacks to the cars, and at Five Mile Point, when loading from the steamer to the N. & F. S. R. R., the sacks are emptied, the ore going in bulk, so that the mine-holder gets far more use for his sacks. Facilities for the shipment of ore are constantly improving, but the railroads and boat lines prevent reduction in charges.

The Mines.

Payne. A little over a year ago the half interest in the "Payne" and adjoining claims was purchased for $87,000 by the owners of the other half, and since then this mine, the first located in the Slocan, has taken first place as shipper, and for the past year has paid its owners, who are very reticent, the largest dividends of any silver mine in the Province. To-day there is said to be now opened up by tunnels and raises a very long shute of ore, from which a daily shipment of fifty tons can be easily maintained for a long period. The cost of mining is very low, very little dynamite being required, and for transporting ore to both the K. & S. and the C. P. Railroads probably the longest three-rail gravity tramway in the world has lately been completed. This tramway is 6,000 feet long, with a vertical drop of 2,500 feet: steel cable, ⅝-inch; load per car, 5 tons; average time of descent, 8 minutes. It passes over trestles for much of the way, but is covered where needed by snow-sheds. At the upper end is a Blake crusher, so that the ore is very easily sacked, little or no sorting being done other than that in the stopes.

Slocan Star. This mine has not been as heavy a shipper during the past year, but the concentrator is kept almost constantly running. The lower tunnel struck the ore-shute, which here so far proves to be concentrating ore, and development work is being pushed.

Ruth. The controlling interest in this property has passed since last report into the hands of an English company, and during the past year this mine has risen to be one of the largest and most constant shippers in the Slocan, while work is being advanced rapidly.

Reco. On this mine work has been confined to the "small vein," nothing further having been done on the larger. The different tunnels have been advanced, and recently some of the best ore ever found in the mine, carrying much pyrargyrite or ruby silver in the galena, has been uncovered. A line for an aerial tramway has been cut out from Sandon to the mine. The mine is closed entirely when snowslides begin to run in the spring, and considerable water comes into the workings. A dividend of $100,000 was declared January 1st, 1898, making $287,500 in all, and another is promised to be paid soon. Mr. Harris is also prospecting several claims adjacent.

Idaho-Alamo. This property last summer passed into the control of the Scottish Colonial Gold Fields, Ltd., and much work is being now done to further develop these and the "Cumberland." The concentrator has had some radical changes made, and at the present time 2,000 tons of high grade ore are ready for milling.

Last Chance. In this mine the discovery of very fine ore shutes is reported by the manager, Mr. T. A. Woods, so that this property will probably become one of the most important shippers during the present year.

Noble Five. This mine was forced to suspend work on account of the lack of funds, and indebtedness. The concentrator and Finlayson tramway, mentioned in Bulletin No. 3, were erected and exploratory work vigorously prosecuted, but, as has since transpired, the large expenditure for tramway and mill was premature, as not much pay-ore was found and the mine soon drifted behind, and with no capital to go further, had to face the inevitable and shut down. Arrangements are now being completed to permit continuance of development under other and better conditions.

The Washington, *R. E. Lee*, *Rambler-Cariboo*, *Best*, *Antoine*, *Surprise*, *Great Western* are still being developed and shipping ore, but work has stopped on the *Slocan Boy*, *Argo*, *Carnation*, *Reed* and *Tenderfoot*, *Monitor*, etc.

Lucky Jim. This mine is now shipping several cars per day to the Pilot Bay concentrator from its large reserves of concentrating ore.

Dardanelles. This company, having well equipped this mine, is now developing and has found, as reported by Mr. Tretheway, in the lower workings the continuation of the ore shute worked in the upper workings by the former owners.

Work is progressing on other properties, from some of which small shipments of typical Slocan ore are being made, and it can hardly be doubted that other mines will soon be added to the list ere long.

Queen Bess. This property is now owned by the Queen Bess Proprietary Co., England, and it is reported that the work done during the past year has shown up much more ore, from which shipments are being made.

Galena Farm, or Galena Mines Company, Ltd., England. When this property was visited in 1896 it was then seen to be one of the most promising prospects in the district, but everyone was amazed on learning that this undeveloped "prospect" was to be overwhelmed by the excessive and absurd capitalization of £550,000, or $2,575,000, and burdened by promises of speedy dividends. The upshot was inevitable. Even yet only a few hundred feet of work has been done, far from enough to prospect but very little of this ground, which, with more extensive development, has many chances of yet proving up well even if at present not much good ore is in sight in this strong ledge, although a very decided improvement is now reported. In the Report for 1896 the presence of zinc blende was mentioned twice, but this mineral is found in all the Slocan mines to a greater or less degree. This property has not had justice done to what was showing a year ago, and it is simply absurd to condemn it altogether. An excellent plant operated by water-power is installed, but for some reason or another the air-compressor, all ready for work, has not been used. A few hundred feet of work on such a property may, as is many times the case, prove nothing of value, while more extended work may, but it is extremely dangerous to make promises of large dividends to the shareholders before the pay-ore has been found and blocked out in sufficient quantities to warrant such promises.

The *Wakefield*, *Thompson*, and *Vancouver Groups*, up Four-Mile Creek, are stated to have good showings of ore, and shipments are being made this winter from the last two. The *Fisher Maiden* resumed work for a time under Mr. Frank Watson.

The *Enterprise*, on Eight Mile Creek, has been developing throughout most of the year and shipping ore, but much heavier shipments are being made this year.

SLOCAN CITY MINING DIVISION.

A good many claims were bonded and explored during the past year, but not much advance was made, as the veins seemed to be broken and irregular, and the high grade ore scattered in "segregations along minor line of weakness." Messrs. Gwillim and Johnson, mining engineers, Slocan City, have kindly sent the following notes:—

Ten-Mile Creek.

Enterprise.—Work was suspended for a time, but resumed Nov. 1st with 40 men. Contracts have been let for the hauling of a large quantity of ore during this winter to the lake. Drifts and upraises are being run.

Kalispel.—Four or five men are at work, and a 5-ton shipment was made in December to the Hall Mines Smelter.

Highland Light.—Three miles up Ten-Mile Creek on the north side two men are at work driving a tunnel (35 feet long) on a vein of high-grade dry silver ore, or native and ruby silver.

Victor.—In the same section and under the same owners two men are working in a 92-foot tunnel on the same kind of silver ore.

Silver Nugget.—This claim lies in Eight-Mile Creek basin over the summit from the "Victor," and a few men are working on very rich silver ore carrying nugget and wire silver, of which ore 5 tons were shipped to the Hall Mines Smelter in December.

Twelve-Mile Creek.—Work has been carried on during the fall and early winter on the dry ore carrying argentite and pyrites, chiefly at the "Paystreak," "Eli" groups and "Jubilee" from the first of which seven tons were shipped to the Hall Mines Smelter.

Springer Creek.

Arlington.—On the "Arlington" Mr. Frank Watson has 12 men at work, the shaft having been sunk to 160 feet and drifts run off at different levels. A steam hoist has been put on, and some fine ore is reported, of which two car-loads were sent to the Hall Mines Smelter in December.

Two Friends.—Six men are at work and some ore is being taken out, one car having been shipped in the fall. A second vein is being opened up.

Meteor.—In the fall 6 to 10 men were at work, but during the winter only 2 or 3. Three car-loads of high-grade ore, running from 160 to 257 ounces of silver and $6 to $14 in gold per ton, were shipped during the fall.

Columbia.—Three men were at work, and a 200-foot cross-cut tunnel, with drifts along the vein of the dry silver ore, had been run.

Evening Star.—This claim is now under bond to Hugh Sutherland, of Winnipeg. A shipment was made in November of rich silver ore, but no work is being done at the present time.

Exchange, Victoria, etc.—Until the early part of December 14 men were at work, but none at present, shafts having been sunk and drifts driven.

I.X.L. and *Excelsior.*—Seven men are at work, and there are now a 55-foot shaft and an 85-foot drift.

Republic.—Is being worked by the original owners who will ship a car-load of silver ore in January.

Lemon Creek.

Howard Fraction.—Work is now suspended. During the past summer a cross-cut tunnel was driven and some drifting done, and two or three car-loads of ore taken out.

Gold Wedge.—From this mine a trail has been built through Kootenay Pass to Kootenay Lake. Twelve men were working and some rich ore is reported as being taken out. This claim is on the second North Fork of Lemon, east of the "Crusader" group.

Crusader.—A 60-foot shaft has been sunk; a few tons of ore are on the dump, and the owners, Faas and Crawford, are now working.

Kilo.—Eight men were at work, and a small shipment of gold ore was sent to the Hall Mines Smelter. Located on the first North Fork of Lemon Creek.

Alberta.—Is being worked by Beauchesne and Livingstone, and a small shipment has been made to the Hall Mines Smelter.

Chapleau.—The original owners now have 4 men at work, and there are two shafts 80 and 60 feet deep with short drifts. Two car-loads of rich ore were shipped late in the year, of which one 20-ton lot ran 5.62 ounces in gold and 60.3 ounces in silver per ton.

Cameronian.—About two car-loads of ore on the dump, ore being sacked for shipment. Little or no development is being now done. There is an 80-foot shaft.

Alpine Group.—Considerable work was done on this property by Alex. Dick during the past year, but all work is now shut down.

TRAIL CREEK DIVISION, OR ROSSLAND.

Since the writing of the last report (August, 1896) on this district, some important events have occurred, and while no other paying mines have yet been developed, "persistent, plucky development work, sustained by ample capital," is now being done on several properties, with very encouraging results, and extensive operations will soon be begun on other claims, work that should definitely determine the existence or no of other ore-bodies in this camp.

A great many people have been attracted to Rossland, where a large, well-built town has sprung up as in a night. Prices for all kinds of mining claims in this vicinity became for a time abnormally high, if such had rusty-stained rock with a little pyrites (and such can be found almost anywhere here), erroneously called "iron-capping," that promised "high values in depth." Many companies were formed, and a few thousand dollars of treasury stock sold, but this proving entirely inadequate to do other than a few hundred feet of work, without discovering ore or proving up a "mine," a great many of these companies have collapsed entirely. Nothing more will be heard of them, and their claims, such as seem to possess merit, will pass into other hands.

As in every other mining centre of prominence, Rossland had to suffer for a time from the selfish machinations of the "wild-catter" and unprincipled boomster, the public at large swallowing nearly everything that was offered them for a while, the phenominal rise in value of the "Le Roi" stock from a few cents a share to dollars proving an irresistible bait. The reaction speedily came, and most of this bubble speculation disappeared. The result was a sudden rebound from feverish activity and speculation to quietness, but this camp has at last settled down to a more business-like basis, and as work increases, and likewise the pay-roll, so, proportionately, will be its prosperity from now on.

Production of Mines.

The following table will be interesting in that it gives, within a narrow margin of exactness, as determined by actual smelter returns, the output of the Rossland mines for each year from the beginning to date. It must be remembered that this table is according to the *smelter returns received* during each year, so that nearly all the ore shipped in December has to be credited to the following year, or the issue of this Report would be delayed until much later.

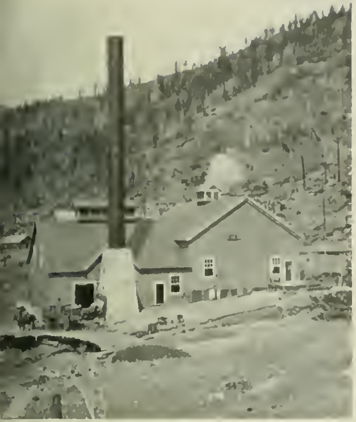
This table gives the *actual yield values* of the ore as paid for by the smelters, or 95 % of the assay values in gold and silver, and the amount of the wet assay of copper, less 1.3 %, and also the net weight of ore, or less the moisture.

NET PRODUCTION, PER SMELTER RETURNS.

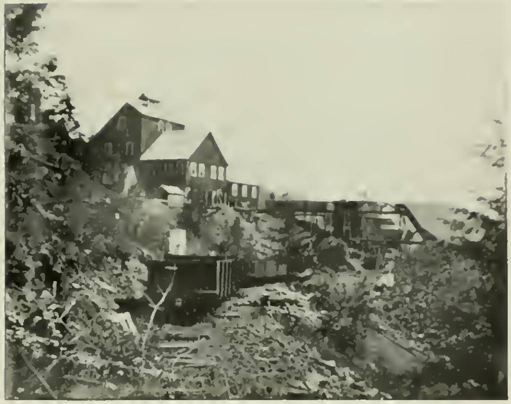
Year.	Tons, 2,000 lbs.	Gold, oz.	Silver, oz.	Copper, lbs.	Value.
1894	1,856	3,723	5,357	106,229	$ 75,510
1895	19,693	31,497	46,702	840,420	702,459
1896	38,075	55,275	89,285	1,580,635	1,243,360
1897	68,804	97,024	110,068	1,819,586	2,097.280
Total	128,428	187,519	251,412	4,346,870	$4,118,607

AVERAGE NET SMELTER RETURNS, OR ACTUAL YIELD VALUES PER TON.

Year.	Gold.	Silver.	Copper.	Value.
1894	2.00 oz.	2.89 oz.	2.85 %	$ 40 69
1895	1.60 ″	2.41 ″	2.10 %	35 67
1896	1.45 ″	2.34 ″	2.08 %	32 65
1897	1.42 ″	1.60 ″	1.32 %	30 48
Average, 128,428 tons	1.46 oz.	1.96 oz.	1.73 %	$ 32 05



LeROI COMPRESSOR PLANT.



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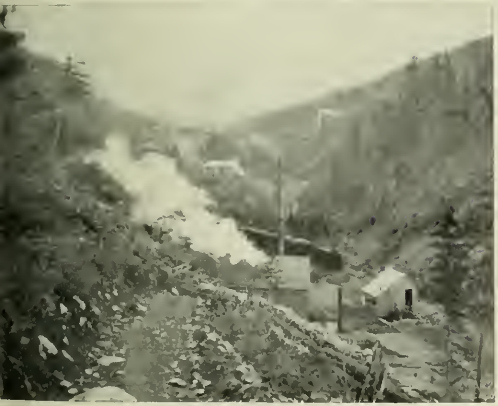
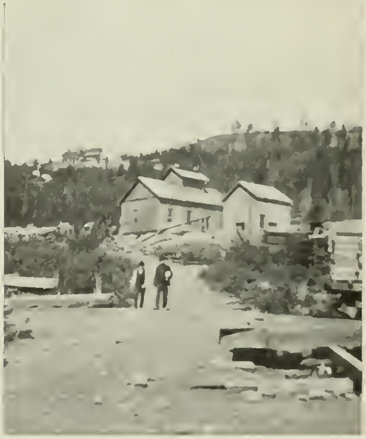


CENTRE STAR GULCH.



NICKEL PLATE MINE.

VIEWS AT ROSSLAND.

From the above values, the cost of mining, transportation, treatment, and Provincial Tax has to be deducted, or, calculating from scanty information, from $15 to $18, leaving a net value or profit for the production of 1897, of from $12 to $16 per ton.

Dividends.

To date, February 1st, 1898, the "Le Roi" has paid $725,000 in dividends, of which $100,000 were paid during 1897. The "War Eagle" has paid $187,000, but none since 1896.

Capital and Sales.

It was early realised that abundant capital would be a *sine qua non* in Rossland, that a weak company would run every risk of failure, despite the fact that the "Le Roi" and "War Eagle" were opened up with comparatively limited means, as their rich pay shutes so happened to come to, or near to, the surface, but since last report several strong companies have made important purchases of mining land, and others would have done so but for the prohibitively high prices then asked for "prospects." Rossland cannot complain of lack of attention from capital, as few mining camps during the last two or three years have been so studied by capital's agents from all parts of the world, attracted by the gold ores, but deterred from purchasing by reason of this being not a milling ore, or by the high figures demanded for ground valuable only as yet by its location in reference to property already proved up a very doubtful value except for speculation.

The first important sales were those of the "War Eagle," in 1896, to Toronto capitalists, for the reported sum of $700,000, and of the "Crown Point" in the South Belt, for nearly $300,000. "Sunset No. 2" has passed into strong hands, and the "Colonna," "Monte Cristo" and "Virginia," are owned and being worked by another strong company, able and willing to thoroughly prospect this ground by very extensive development work if needs be. More recently, the British American Corporation, Limited, representing strong English capital, has acquired by purchase the "Josie," "Nickel Plate," "Great Western," "Poorman," "West Le Roi" and "Josie No. 1," "Columbia and Kootenay," and other claims in the very heart of the camp, upon which vigorous work will be at once begun and carried on extensively. Another English Company, represented by Sir Charles Tupper, has secured the "Velvet" and other claims on Sophia Mountain, where a new and important area is being carefully tested, about five miles west of Rossland.

Work is progressing on the "Deer Park," "Iron Colt," "Lily May," "Jumbo," "Cliff," "Abe Lincoln," "Coxey," but all work has ceased on the "City of Spokane," "Iron Horse," "C. and C," "Georgia," "Evening Star," "St. Elmo," "San Joaquin," "Palo Alto," "Nest Egg," "Mayflower," "California," "White Bear," "St Paul," "Commander," and other properties, for the working of which much more capital is now required. If the arrangements are concluded satisfactorily with English investors, work will be soon resumed upon the "Homestake," "Gopher," "R. E. Lee," and "Maid of Erin" properties, with a good supply of capital. Of course it is needless to say that besides the above properties, a large amount of work is being done on the "Le Roi," "War Eagle," "Centre Star" and "Iron Mask."

It is now superfluous to state that it is useless to attempt mining in this camp with limited means, as the costs of mining are high, and calculations as to the amount of work necessary may prove altogether too low, and work have to cease by funds being exhausted, just when the prospecting should be pushed for all it is worth.

Condition of Mining.

Except for the work done on eight or ten claims the amount of development has been to the present too small to demonstrate much, consisting, as it has, of short tunnels or drifts and shallow shafts, but where more generous development has been done, the results so far have been most encouraging, new ore bodies have been uncovered, or ore bodies hitherto carrying little or no values are found to be increasing in value. More pay ore is now in sight than at any other time in the Camp's history, and the writer still holds to his belief that "it is quite impossible that the large shutes of rich ore that have been shown on the surface by denudation, will be found to be the only ones."

As to the vexed question of Rossland ore increasing in value as greater depth is attained, the tables above will answer in part and in the negative, that is, the shutes of pay ore that have been mined from near the surface downward, are not showing higher values in depth, but are maintaining well the gold values, but it must be remembered that ore that could not be worked two years ago is now being treated at a profit, with the inevitable result that as lower grade ore is shipped, the tonnage greatly increases, but the average values decrease. On the other hand, if in sinking a new ore-shute is reached, it is only natural and consistent to expect that the low values first found in the out-lying portions, or the fringes, of these replacement ore-bodies, should increase as the heart of the ore-shute is entered, and in such instances as this values do increase with depth. In these ore-deposits formed by replacement and impregnation of the country rock by mineralized waters passing up and along relatively small channels, it is proper to suppose that the richest ore, in most cases, will be found at or near this channel, while the most distant ore will be of decreasing value directly proportionate to this distance. That this is so, is very evident in the "Le Roi," where the core or the heart of the ore-shute is found to be of the richest grade, a number of shipments of 30 to 90 tons each, during the past year, 1897, running from 2.6 to 4.5 ounces of gold, 2 to 4 ounces in silver per ton, and 5 to 7 % copper.

Up to the present, development work to any extent, such as entitles a property to be called a "mine," has been limited to only a few claims, but with the advent of the strong companies above mentioned, and the endeavours of the less strong but progressive operators, present conditions indicate a healthier and more substantial stage of affairs in Rossland, where more thorough work is being done, more men are being employed, and a campaign of development is now inaugurated, that aided by better and cheaper facilities for transport and treatment, should decisively determine whether or not other bodies of gold ore here exist.

The condition of the already established mines, such as the "Le Roi," "War Eagle," and "Centre Star," is excellent, they have never looked as well as now, and faith in this unique gold camp is strong in those best acquainted with all the details. By reason of its gold that is now so attractive, or fashionable, to foreign investors, Trail Creek is a most important district, and for some years at least the prosperity of the mining industry of the Province will be greatly influenced by the prosperity here, at least as far as investors are concerned.

Ore bodies.

Since last report the ore body in the "Le Roi" has been found to maintain its fine dimensions to the present depth of nearly 700 feet, and in July, at time of visit, in the bottom of the shaft, then at the 600-foot mark, were 7 feet of solid, high grade, or first-class ore, apart from 16 feet of lower grade ore since exposed by cross-cutting. On the 500-foot level was seen a shute of good ore, 6 to 14 feet wide, then extending for over 400 feet in length without reaching the limits of the shute. What at the time of former visit appeared as two faults crossing the ore-body, about 175 feet apart, have since been shown to be two cross-courses or dykes of rock very similar in appearance to the adjacent country rock, which have apparently faulted the ore-body very slightly, or for a few inches only. In the roof of the lower stopes could be beautifully seen the band of laminated calcite from a few inches to 2 or 3 feet wide, running longitudinally through the heart of the ore-body, as was spoken of as also existing in the upper workings, and of course abruptly crossed by the dykes.

In the "Centre Star" a very large amount of low grade ore now stands exposed, among which is good shipping ore, of which several shipments have been made by Mr. Durant during the year, the first from this mine. In the "War Eagle," very little ore was left in sight when the mine passed into the hands of the present company, but since then, Mr. Hastings has uncovered a large amount of good ore, both in the upper and in the lowest workings, and this property is being most systematically explored, a large amount of ore is being blocked out, but left standing awaiting cheaper freight and smelting charges. The "Iron Mask" has shipped considerable during the year, but shipments have been deferred by reason of the lawsuit now pending with the adjacent "Centre Star," over extra-lateral rights. Early in the year the "Josie" opened up an ore-shute near the "Poorman" line, but work is now being confined mostly to the drifts from the shaft.

On the "Monte Cristo," where was found near the surface such a body of valueless pyrrhotite, in the lower tunnel and incline from same, or to a depth of nearly 500 feet from the surface, has been found ore carrying much more copper and enough gold that should make this, if correctly reported by the management, good pay-ore, but extensive exploratory work is being pushed ahead vigorously. On the "Evening Star" more good ore has been found, but there has not been sufficient capital forthcoming to prospect this claim in a bold and thorough manner. Very little or no work has been done on the Monte Cristo Mountain during the past year, nor on Red Mountain, except on the "Rossland Red Mountain," "Cliff," "Monita," "Coxey," where as yet no pay-ore bodies are yet reported.

In the "Kootenay-Columbia" has been exposed a large amount of low grade, barely profitable pyrrhotite, which has also been struck in the adjoining "Iron Colt" claim, where much more work will be done to discover if higher values can be found in these shutes. On the "Sunset No. 2" ore has been found carrying good values in three places, and the large body of, as yet, too low grade pyrrhotite is being further explored on the "Deer Park," where work had been suspended for some time. The body of ore found near the surface on the "Crown Point" has not yet been found in the lower workings. On Sophia Mountain (not inspected) it is said that fine bodies of rich copper ore carrying both gold and silver are being now opened up by Capt. Morish, and this will be of great importance if a large mine is here found, as it will mean the extending of this area as known to be mineral-bearing, and the results of this work will be watched closely. On the "Jumbo" work has been continued without ceasing, and much more low grade material is now in view.

The next two will be important years for Rossland, as the amount of exploratory work now promises to be much more extensive, and on several properties at least, known only as having most favourable surface showings, exhaustive. It is hardly to be expected that progress will be by leaps and bounds, but steadily progressive, and the prosperity of the town must be dependent, as every other mining town, upon the amount of production and pay-roll, as the hurrah of the speculator must inevitably give way to the more permanent and definite work of the miner.

Ore Treatment.

Smelting—Since Bulletin No. 2 was written, several important alterations in plant and method have been made at the Trail Smelter, by which it has been made possible to smelt these ores under existing advantages or disadvantages after the best manner. The roasting of the ore is being done in heaps 16 feet deep, of 200 to 300 tons each, with more satisfactory results, as the slow, gradual roast in the heap appears to be much more thorough and effectual than in the mechanical calciners, where the particles of ore or pyrrhotite seemed to be case-hardened, as it were, thus preventing the burning of the inner kernel of the sulphides. Large blast furnaces are now used, and the matte is being refined so as to yield gold bullion.

In respect to smelting charges, there has been little or no reduction, the average price being $11 per ton for freight and treatment. The Le Roi Company recently completed its contract of 75,000 tons for Mr. Heinze's smelter, and during the past year has erected a smelter at Northport, on the American side, whither ore is being now regularly shipped direct from the mine tramway over the Red Mountain Railroad. While Mr. Breen is general manager, Mr. H. C. Bellinger has resigned his superintendency at Trail to assume that office at the Le Roi smelter, where he will be at home with the best methods of handling this and other Rossland ores, as this smelter will do custom work. It is much to be regretted that this plant has left Canada, but the Le Roi people, feeling that money could be thus saved, have been constrained to build there, as the most stragetic point available, although with further railroad facilities, as will be afforded when the C. P. R. builds from Rossland to Robson, on the Columbia, where cheap coke and coal will be landed from the Crow's Nest Pass, conditions, having a very material effect on this camp, will be considerably altered, and had this road come sooner this smelter might have been saved to the Province.

Awaiting other railroad building and cheaper fuel, and anticipating lower treatment charges, the "War Eagle" mine has ceased shipping from the large reserves now blocked out, except the ore taken out in development. The "Centre Star" and "Iron Mask" have been making shipments, and small lots have been sent from some other properties. So far Rossland itself has not been considered suitable as a smelter site, by reason of the facts that the water supply is very limited, and that fuel, fluxes and other ores would have to stand the heavy up-hill haul, and it has been estimated to be cheaper to take the ore down grade to a point where all the smelting essentials can be most advantageously assembled.

That smelting charges will be somewhat reduced before long it is not doubted. Mr. R. R. Hedley, in a paper on the "Possibilities for Smelting in B. C.," recently read before the B. C. Mining Society in Vancouver, stated that with a large plant, cheap fuel and minimum freight rate "the Rossland ore might yet be smelted for $7 per ton f. o. b. at a profit to the smelter." Under such conditions then, with the cost of mining reduced to the lowest notch, large bodies of $12 ore *may* yet be mined and smelted at a profit, but at present a very small margin, if any, of profit remains on $16 ore, and then only in the case of large ore-shutes, where mining can be done at the minimum cost.

The very low percentage of copper in these ores, coupled with the fact that copper ores are so far not to be obtained for intermixing, at once makes the problem of smelting more difficult, but the last has not been said or done concerning the smelting possibilties at Rossland.

Note.—As this report goes to press, it is reported that the Canadian Pacific Railway Company has purchased Mr. Heinze's smelter at Trail and the narrow gauge railroad to Rossland, and that much lower rates for freight and treatment are to be offered.

Wet Processes.

In assaying these ores fine metallic gold is almost always found on the sieves, so that the smelters have to specially determine this metallic gold in nearly every smelter pulp. The low grade ores offer big scope to the metallurgist, and while a good many laboratory tests have been made, yet it remains to be proven whether much of this ore is amenable, profitably, to one or more of the wet processes.

In the January number of the B. C. Mining Record Mr. Pellew-Harvey, F.C.S., states in "Notes on the Cyanide Process":—"I have made a good many experiments with these sulphide (*i. e.*, Trail Creek) ores (those with under two per cent. copper, about five pennyweights gold per ton, and one to two ounces of silver), and I have found that with a thirty-mesh screen and ninety hours' treatment and cyanide consumption of three pounds, that eighty to eighty-five per cent. of gold values, and sixty per cent. of the silver, are recovered. By fine crushing and removal of slimes, by amalgamation and cyanidation, I have recovered as much as ninety per cent. of the gold."

The British Columbia Bullion Extraction Co., London. Mr. L. H. Webber is now erecting for this company a 50-ton mill on the line of the Red Mountain Railroad, 2.5 miles west of Rossland. This process of extraction is by an electro-chemical method, and for over a year tests have been made with very favourable results in Denver, Colorado, on large lots of low grade Rossland ore. A water-power of about 100 h. p. will be available for about eight months from two sources, and at the present time a dam and 4,000 feet of fluming have been put in to bring the water from one creek. In the mill will be sampling machinery consisting of a rock crusher and rolls, and some form of automatic sampler, 150-ton storage bins under a switch from the railroad; in the mill some form of pulverizing machinery, yet to be chosen, vats, tanks, etc. The boarding and bunk houses are now built, the timbers for the bins and mill are framed, electrical power may be purchased, and work is expected to begin May 15th on the low grade ore now thrown on the mine dumps as waste. The purpose of this company is to buy the low grade ore on the dumps, paying cash for ore running $6 to $15 per ton in gold and silver according to a sliding scale proportional to values contained.

The operation of this mill, which can easily be enlarged, may prove of great importance to the camp in determining a course of profitable treatment for the large bodies of low-grade gold ore which, in all likelihood, can never be treated except by some wet process, and its progress and results will be awaited with great interest and concern.

Railroads.

Since last report the Columbia and Kootenay Railroad has been extended as a broad gauge to Robson, where daily connection is made with the steamers to and from Arrowhead, and the trains of Nelson and Slocan City. The Red Mountain Railroad has been completed from Northport to Rossland, crossing the Columbia River by a steel bridge.

From Robson a line has been surveyed by the C. & K. west into Grand Forks and Boundary Country, and the C.P R. corps are surveying a line to Rossland, the construction of which they have promised to complete at an early date.

Geology.

During the summer of 1896 Mr. R. G. McConnell, of the Dominion Geological Survey, made a survey of the Rossland District, and an important account was given in the "Summary Report for 1896" which is now appended. During the past year a valuable reconnaissance geological map was issued by the Department of the Geological Survey.

"CHARACTER OF THE COUNTRY.

"The region examined forms part of the southern continuation of the Selkirk Range, and is everywhere of a rugged and mountainous character. It is traversed by several large and deep valleys running in different directions, the principal ones being those of the Columbia, the Kootanie, the Slocan, the Beaver and the Salmon. Draining into these are numberless small streams, usually of no great length, which take their rise among the higher peaks and summits and descend through deep wooded valleys to the main rivers. The present rough condition of the country is mainly due to the slow but persistent wearing action of these streams, or their predecessors on rocks of different hardness, the process having continued long enough to entirely obliterate all traces of the earlier configuration.

"The most prominent range south of the Kootanie is the group, called on some of the maps the Beaver Mountains, situated in the granite belt west of the North Fork of the Salmon. The higher peaks of this range approach an altitude of 8,000 feet. A number of peaks of scarcely inferior height also occur south of the head of Hall Creek. South of the Beaver Mountains the country declines 1,000 feet or more in general elevation, and the contours of the hills and ridges become more uniform and rounded. Portions of the interior of this district bear strong resemblances to a boldly rolling plateau. West of the Columbia River an apparently endless succession of deep branching valleys and lofty ridges crowned at intervals with sharp peaks and crests are everywhere met with.

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"PREVALENCE OF IGNEOUS ROCKS.

"The most noticeable feature in the geology of the district examined is the marked predominance of rocks of igneous origin. Two great series are represented, of which the older consists mostly of porphyrites, diabases, gabbros, tuffs and agglomerates, and the younger granites.

"GRANITES.

"The granites belong to the same mass so largely developed in the country north of Kootanie Arm, and outlined in my summary of last year. The normal type is a medium grained, grayish rock, consisting mostly of biotite, hornblende, quartz, orthoclase, and plagioclase, but great varieties in both texture and composition are frequent. In places, and over considerable area, the development of large feldspar crystals give it a distinct porphyritic appearance. When crushed, this form results in a typical augen-gneiss. With variations in the proportion of its constituents, the granite passes into hornblende-granite, granodiorite, and mica-syenite. The latter, cut by dykes from the acidic varieties, occurs largely along the Kootanie River west of Nelson.

"DISTRIBUTION OF GRANITES.

"The granites, except for some small inliers of schists, are found in their various phases all along the Kootanie River, and down the Columbia to near the mouth of Bear Creek. The south-eastern edge of the area crosses the Columbia River below the mouth of Bear Creek, and continues south for some distance along Lookout Mountain Ridge. West of the Columbia River from Lookout Mountain north to China Creek, the granites occur in a band from one to two miles in width, following the river and sending out occasional spurs to the west, one of which partly encircles the Kootenay-Columbia and Monte Cristo mountains, but north of China Creek it spreads westwards beyond the edge of the district treated of. East of the Columbia River, the granites extend, in an irregular-shaped mass from three to ten miles in width, north-eastward to Hall Creek. Besides the main granite area, numerous bosses and reefs of granite, evidently of the same age, break through the older rock throughout the district. The largest of these crosses the Nelson and Fort Shepherd Railway near Salmon Siding, and extends eastward into the still unknown country between the Salmon and Kootenay Rivers.

"The rocks on the Columbia River, for some miles above and below the mouth of Champion Creek, have some resemblance to parts of the Shuswap series. They consist of mica-schists and gneisses, evidently derived from granites interbanded with pegmatite, and the ordinary gray granite of the district in a more or less schistose condition. Somewhat similar rocks were also found on the Slocan River, near the 15-Mile House, but the presence there of some bands of lustrous mica-schists, typical of the Shuswaps, led me to infer them to that series.

"PORPHYRITES AND ASSOCIATED ROCKS.

"The older system of predominantly porphyritic rocks through which the gray granite breaks, occurs under so many forms and in such different degrees of preservation that it is highly probable rocks of different ages are represented in it. The prevalent rock of the series is a greenish augite-porphyrite often passing into a porphyrite. The ground mass of this rock is usually diabasic, and in many places the augite phenocrysts of the porphyrite disappear, and it passes into a fine-grained diabase. The porphyrites, while often massive and uniform in texture and appearance, usually show a more or less brecciated structure on weathered surfaces. The embedded fragments and the groundmass, except for slight differences in colouration appear, microscopically, almost identical. Besides the augite-porphyrites and diabases, massive eruptive rocks are also represented by gabbros, small areas of which occur at

Rossland and on the North Fork of the Salmon, and by the grayish porphyrites with plagioclase phenocrysts of Toad Mountain and Spokane Mountain. Fragmental volcanic rocks consisting of tuffs and agglomerates occur on Granite, Spokane and Sophia Mountains, and also on the ridges south of Lake and Bald Mountains, and in other places in the district. The agglomerates are calcareous in places, and are interbedded occasionally with bands of fossiliferous limestones. The fossils collected are imperfectly preserved, but are probably Carboniferous in age.

"SLATES.

"The eruptive series of rocks inclose bands and patches of dark fissile slates, which appear in most cases to be residual portions of the formations amid which the igneous rocks were erupted, as none of the bands, even where a thousand feet or more in thickness, can be traced for any distance along the strike. Slates holding small limestone bands occur on Hall Creek, on the North Fork of the Salmon, on Trail Creek, and in other places.

"DYKES.

"The granites and other rocks of the district are cut by numerous dykes and bosses, mostly belonging to about the same period, but showing extreme variations in texture and composition, specimens showing a range from light coloured acidic rock to a dark basic one, and from a microcrystalline, to a coarse granitic condition.

"The distribution of the various members of the eruptive series is extremely irregular, and owing to the large proportion of the surface concealed by drift and forests, and the limited time at our disposal, it was found impossible in many cases to trace out junctions except in an approximate manner. A brief statement of the distribution and character of this group so far as known, will, however, be given here; being of great economic interest, inasmuch as it contains the gold-bearing pyrrhotite ores which have made the district famous. The principal rocks of the series are now being examined microscopically by Mr. Ferrier, and some of the names given here may be altered when his investigation is completed.

"DISTRIBUTION OF GABBROS.

"At Rossland, the central member of the group is a fine to coarse-grained *gabbro*, apparently passing in a couple of places into a uralitic granite. The gabbros occupy an irregular-shaped area, with a length of about four miles and an average width of one mile. They extend from Deer Park Mountain eastward to the western base of Lookout Mountain. The line of junction between the gabbros and the bordering porphyrites, commencing at the north-west corner of the area, runs south through the Cliff, War Eagle and Le Roi claims; then turning to the west, circles round the spur from the main area which covers part of the Deer Park Mountain and continues eastward in a sinuous line, passing about a quarter of a mile north of the Crown Point mine to the foot of the west slope of Lookout Mountain. The northern edge of the area runs from the Cliff mine eastward to Monte Cristo Mountain, then bends more to the south, and skirting the southern base of the Kootenay-Columbia Mountain, continues in a south-easterly direction towards Lookout Mountain. The eastern edge of the area has not been precisely defined, owing to the absence of sufficient exposures. The gabbros are fringed with a varying width of augite-and-uralite porphyrites and fine grained green diabases. The passage from the porhyrite to the gabbros is nowhere sharply defined, and the two rocks have apparently originated from the same magma, but have cooled under different conditions. The gabbros and bordering porphyrites are important from an economic standpoint, as most of the ore-bodies at present being worked are situated either on or close to their line of junction.

"MASSIVE AND FRAGMENTAL IGNEOUS ROCKS SURROUNDING GABBROS.

"In passing outward from the gabbro area, a section taken at almost any point, shows a bordering zone of brecciated porphyrites and diabases of varying width, but seldom exceeding a mile beyond which comes an alternating series of porphyrites, tuffs and slates, and still farther away agglomerates, associated in places with fossiliferous limestone, make their appearance. Slates and tuffs occur with the porphyrites on Red Mountain, on Kootenay-Columbia Mountain and south of the gabbro area on Lake and Bald Mountains, and the ridges running south from them. Agglomerates make up the main mass on Sophia Mountain and occur with slates, tuffs and porphyrites on Granite, Spokane and Grouse and Lookout Mountains, and on the ridges immediately east of Sheep Creek.

"VOLCANIC ORIGIN OF ROCKS.

"The roughly concentric arrangement of the Trail Creek rocks, and the gradual passage outward from a holocrystalline central area through semi-crystalline rocks to bedded volcanic fragmentals, suggest an ancient (although now deeply eroded) volcanic centre, situated near the site of the present town of Rossland, from which lavas and ashes deluged the surrounding district. The presence of small bands of coral-bearing limestone with the agglomerates and tuffs, also makes it probable that a shallow sea existed at the time of the out-burst, and that the eruptions were intermittent and continued during a lengthened period.

"SERPENTINES.

"The porphyrites on Spokane and O. K. Mountain, and on Lake Mountain are much fresher looking than those on Red Mountain, and may belong to a more recent period. An area of partly and wholly serpentized rocks occurs on Sheep Creek, between the western base of Deer Park Mountain and O. K. Mountain.

"From Rossland, porphyrites and associated rocks, often crushed into a schistose condition and accompanied by bands of argillites, were traced northward across Rock and Murphy Creeks to China Creek, where they are cut off by the gray granites.

"DISTRIBUTION OF PORPHYRITES AND ASSOCIATED ROCKS.

"West of the Columbia River, porphyrites and other igneous rocks similar to those at Rossland have a wide distribution. They are found along the Columbia River from the boundary north to near the mouth of Beaver Creek, where they are replaced by granites, and thence were followed in a north-easterly direction along the line of the Nelson and Fort Sheppard Railway to within a couple of miles of the Kootenay River. The width of the band was not ascertained, as the country east of the Nelson and Fort Sheppard Railway was not examined, except at a couple of points. From the railway, west to the granite area, a variable distance, dependant on the sinuosities of the latter, the country is altogether occupied by these rocks. They were found at the head of Beaver Creek and Champion Creek, and along the lower part of the North Fork of the Salmon. Near the mouth of the latter stream is a small area of gabbro, indistinguishable in appearance from that at Rossland, while farther up augite-porphyrites, of the ordinary type, accompanied by diabases and slates, make their appearance. The series here, as over most of the district, is traversed in all directions by porphyrites and other dykes of a later age.

"DISTRIBUTION OF ORE BODIES.

"The auriferous iron and copper sulphide ores at Trail Creek occur almost exclusively in the massive members of the eruptive series, and most of the important ore bodies which have so far proved productive are situated either on or close to the line of contact between the gabbros and surrounding porphyrites and diabases. The Le Roi, War Eagle, Cliff and a number of other leads west of Centre Star Gulch cut through the line of junction almost at right angles, while the Josie is situated a short distance to the left of it, in the porphyrites, and the Centre Star workings almost immediately east of it, in the gabbros. The Monte Cristo and Deer Park claims occur close to the same line, the Kootenay-Columbia a few hundred feet to the north of it, in a band of porphyrites, and the Crown Point, Homestake, Gopher and other leads in the south belt, a short distance to the south of it, in diabases and porphyrites. The ore bodies are, however, not altogether confined to the neighbourhood of the central gabbro area, but are also found in the bands of massive porphyrites which alternate with the surrounding volcanic fragmental rocks and argillites. The Jumbo is situated on one of these belts, as is also the Coxey, the Giant and a number of other claims. The tuffs, agglomerates and associated slates, with few exceptions, and those of little promise, do not carry the typical iron and copper sulphide ores characteristic of the Trail Creek region, but are traversed by occasional quartz veins which appear to belong to a later date.

"TRAIL CREEK ORE.

"The ores of the massive eruptive rocks, as stated above, consist principally of sulphides of various metals. Of these pyrrhotite or magnetic iron pyrites is by far the most abundant. This mineral constitutes the common Rossland ore, and also occurs in quantity, among other places, on Bear Creek, Champion Creek, the North Fork of the Salmon, and at Waterloo. It is found, as a rule, in a massive condition, ranging in texture from a fine to medium grain, but it is also disseminated through the country rock.

The massive variety usually holds blebs of quartz and grains and irregular patches of other sulphides. The pyrrhotite contains gold and silver in varying quantities, a small percentage of nickel and traces of cobalt. A specimen from the Iron Colt, analysed in the laboratory of the Survey, gave 0.234 per cent. nickel, and one from the Monte Cristo 0.13 per cent The gold contents are exceedingly irregular, ranging from traces up to several ounces to the ton, and the silver from traces to four or five ounces to the ton.

"Chalcopyrite.

"The pyrrhotite is usually accompanied by a certain amount of chalcopyrite or copper-pyrites, intimately commingled with it. The copper-pyrites is extremely irregular in its distribution in some places, constituting a considerable proportion of the ore-body, and in others occurring only as isolated and occasional grains and patches. It was nowhere seen pure in large masses. It is auriferous, and holds apparently about the same percentage of gold as the inclosing pyrrhotite.

"Mispickel.

"Mispickel or Sulph-arsenide of iron, is found associated with the pyrrhotite in a number of the mines, and in places occurs in considerable quantities. It is auriferous, and at the Evening Star mine, and possibly at other places, a portion of the iron is replaced by cobalt, and it passes into cobaltiferous mispickel or danite. Dr. Hoffman furnishes the following note on this mineral :—The specimen consists of a fine to coarse crystalline calcite, carrying a cobaltiferous mispickel—most probably the variety known as danite. It is coated in parts with ferric hydrate and peach-blossom red, hydrous cobalt arsenate (earthy cobalt bloom, a variety of erythrite), resulting from the decomposition of the mispickel. The mispickel may not improbably contain sufficient cobalt to be of economic importance, a point which will shortly be determined, the analysis of the mineral having been entered upon.

"Molybdenite.

"Molybdenite or sulphide of molybdenum, occurs at some of the mines, notably at the Coxey and Deer Park. At the latter mine it is stated to be highly auriferous.

"Other Minerals.

"Besides the above minerals, galena and blende occur at the Lily May and other locations in the south belt, and also at the Union and other mines to the north of the main mineral area, but are not found, so far as I am aware, in the principal Red Mountain mines. Ordinary iron-pyrites is met with in greater or less quantities nearly everywhere.

"The ores are usually oxidized on the surface, but the alteration seldom extends downward for more than a few feet, and in some cases a single shot brings the unchanged sulphides into view.

"Classification of Ore-Bodies.

"The classification of the Trail Creek ore-bodies, and the sulphide deposits generally of the igneous rocks of the district is a difficult problem, and one which has given rise to considerable difference of opinion. They may be (1) original segregations from a cooling magma, like the Sudbury pyrrhotite ores, (2) secondary segregations from the basic rocks which inclose them, (3) replacement veins along the lines of fissuring, or, as the majority of the miners are inclined to believe, (4) true fissure veins. Isolated examples might be cited in support of any of these views, but taking the deposits as a whole, the theory which fits in best with the prevailing conditions is undoubtedly the third. The blunt irregular outlines of some of the ore-bodies, and their fissure-like regularity in others, the presence in most cases of a single wall which is often meaningless as a confining line and the occasional lack of any wall, the gradual blending of the ore from ascending heated waters, which have eaten away portions of the country rock along lines of fracturing, and replace it by the materials held in solution. The definite and approximately parallel direction, and dip of the majority of the Rossland leads, the silicious

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character of many of the ores and the presence of calcspar in seams and irregular pockets, tell against the theory of original segregation, which has of late years been applied to somewhat similar deposits in different parts of the world, while the ordinary ear-marks of fissure veins, as usually understood, are seldom observable.

"Permanency of Ore-bodies.

"The miners of the district are generally prejudiced in favour of fissure veins, under the belief that they are the only ones which are apt to be continuous in depth. There is no reason however, why replacement veins following lines of fissuring, and filled with material derived from below, though subject to greater variation in volume, should not be equally permanent.

"Auriferous Quartz Veins.

"Besides the pyrrhotite and associated sulphide-ores characteristic of the basic volcanics, an important system of silicious ore-bearing fissure veins has a wide distribution in the district. The quartz leads are not confined to one formation, but occur indiscriminately in all. The O. K. occurs in an altered and partly serpentinized basic volcanic rock; the Fern in massive porphyrite; the Poorman, Maud S. and Clearwater, in granite; the Exchequer, in schistose eruptives; the Elsie, in granite. The quartz leads vary greatly in size, but seldom exceed six to eight in width, and usually average less. They contain free gold, auriferous pyrites, chalcoprite and galena. Stamp-mills have been erected at the Poorman and Fern, and a number of the other leads are being prospected."

TROUT LAKE MINING DIVISION.

The Trout Lake Mining Division lying north of the Slocan and between the Ainsworth and Lardeau Divisions on the east and west respectively, embraces all that territory drained by the rivers and streams flowing into Trout Lake, into the Lardo River above Cascade Creek and into the Duncan River above the summits south of Hall and East Creeks, all the drainage of this area being by the Lardo and Duncan Rivers into the northern end of Kootenay Lake.

Roads and Trails.

The best means of approach now open is by the Government waggon road from Thompson's Landing at the upper end of the north-east Arm of Upper Arrow Lake, running north-easterly eleven miles, where one branch in one mile enters Trout Lake City on the upper end of Trout Lake at the mouth of Lardo Creek, while the other, in four miles, reaches the new town of Ferguson, now springing up on the large bench below the Forks or the confluence of the North and South branches of Lardo Creek. This would be a very good road but for three or four miles where it passes through very wet ground in the heavy timber, where a great improvement would be effected by slashing or cutting down the timber and corduroying the worst places, the large cedar here being especially suited to this purpose.

This road was being continued four miles by the Lillooet, Fraser River and Cariboo Gold Fields Co., up the creek from Ferguson to Eight-Mile, whence the trail will run up to the "Silver Cup" and "Sunshine" mines. A trail, seven miles long, runs from Trout Lake City to the "Great Northern" or "Alpha" group, while a new trail is being built from the Lillooet, Fraser River and Cariboo Gold Fields Co.'s camp, near Ferguson, to tap this trail three miles from this group, for the easier transport of supplies and ore.

From Ferguson, trails lead up the North Fork seven or eight miles to the "Commonwealth" group and other claims, while another runs from the end of the waggon road at Eight-Mile to Ten-Mile, or the junction of Gainer Creek with the South Fork, whence a trail branches up Gainer Creek to reach the "Molly Mack," "Silver Chief," "Black Prince," "Badshot" and other properties, and the main trail, but a very rough one, continues up the South Fork, crosses a summit down into Healy Creek, up which it passes to connect with the "Abbott," "Wagner" and other groups of claims on the divide west of the Duncan River, 20 to 25 miles by trail from Ferguson.

From Trout Lake City by row boats, trails running up some of the creeks on either side of the lake, are reached, and from the foot of the lake an incompletely cut out trail runs down the Lardo River to Kootenay Lake. Trails also are cut out between Kootenay and Howser Lake, on which is a small steamer to accommodate the many prospectors now prospecting the upper tributaries of the Duncan, up which river they travel by boat, as the trail as yet is but poorly cleared.

Another road has been partially completed by the above-mentioned company from Rosenheim, on Upper Arrow Lake, through a comparatively low pass to connect with the road from Thompson's Landing to Trout Lake City. A small steamer may soon be placed on Trout Lake, which is eighteen miles long.

RAILROADS—PROJECTED OR POSSIBLE.

This district, while very mountainous, by reason of the deep valleys and low passes, will be comparatively easy to penetrate with railroads, such as by a line from Upper Arrow Lake *via* Trout Lake and Lardo River to Kootenay Lake whence, it is claimed, no serious difficulties are to be met with in ascending the valley of the Duncan River should developments warrant the construction of a line into this region.

Already a preliminary survey has been made from Arrow Lake to Trout Lake and thence up Lardo Creek to Gainer Creek, and charters are extant for roads up Duncan and Lardo Rivers.

TOPOGRAPHY.

This district is very mountainous, especially that part drained by the Duncan River, and the divided summits of highly-tilted sedimentary rocks tower from 7,000 to probably 11,000 feet in height, harbouring in the high basins and on the divides glaciers and perpetual snow, affording scenic effects of great grandeur and beauty probably unsurpassed anywhere in the Province. The mountain-sides are steep, leading down into deep, narrow valleys, which are heavily and densely timbered, more particularly in the Lardo basins, to an elevation of 5,000 to 5,500 feet above sea level, a condition that so far has compelled most prospecting to be done nearer the summits, where the rock is more exposed, with the result that the mining work now being done ranges in elevation from 5,000 to 8,000 feet, although now, guided by the known trend, some of the leads are being traced down to much lower elevations, where, in the valleys, they should be found as well and as strong, probably, as near the rock-bare summits.

The under-brush, up to an elevation of about 5,000 feet, is heavy, and little or no feed for horses can be found, except near and above timber line, where it is generally excellent. The country is drained by many creeks and strong streams, which will yet prove of great value for milling and power purposes, although in the autumn and winter months the amount of water must necessarily be of much less volume than during the rest of the year.

Altogether, the surmounting of the natural conditions that here obtain will be in nowise greater, in the writer's belief, than those that have been so splendidly overcome in the high mountains of the Slocan, where the apparently inaccessible mines are now being made easily accessible by railroads, roads, trails, and the far-spanning aerial tramways. If good mines of good grade ore are developed, the means for transporting ore to the markets will be supplied, but the mines must be first proved up before others can be expected to supply these means.

GEOLOGY.

Trending north-west and south-east, south-west of the Trout Lake and the Lardo River valley, is the area of schists, gneisses, and granites, now proving to be mineral-bearing; but to the north-east of this line is a large area of highly-stratified sedimentary rocks that, for a width of six to ten miles, comprises a great thickness of slates, shales, and calcareous schists, with thin beds of quartzite and limestone, trending also north-west and south-east, standing nearly vertical or dipping south-west up to the great belt of marbleized limestone, or "Lime Dyke," as it is locally called, to the north-east of which the dip of the formations is to the north-east.

This limestone formation (*see* Frontispiece), evidently both over and underlaid by slates, shales, etc., is evidently the apex of a very steep and sharp anticline, of which the sharp crags and peaks of limestone form such a marked feature for miles through this region, or else it has been elevated to its present position along a line of faulting, although at the head of Hall Creek, near the "Wagner" group of mines, the evidence of a steep anticline seemed conclusive, and the dipping of the formations either way from this apex was most apparent. On the south-west side, the line between the lime and slates runs in a straight line for many miles, and along and near the line of contact on either side of this limestone, but more especially on the south-west side, prospectors are at work, although all veins, so far, with some exceptions, have been found in the slate and schist formations, not only near the lime belt but several miles away, as exemplified in the "Silver Cup," "Great Northern," and other groups, so that a wide extent of country here presents possibilities for the location of veins of pay ore, and already the discoveries so far made have not been localized but widely scattered.

The limestone that has attracted hither many prospectors and miners who have worked in the great silver mines in the Carboniferous limestones at Leadville and Aspen, Colorado, and know the great possibility for the deposition of rich ore-bodies in such a formation, is very solid and highly altered, and as yet known, not traversed and influenced by intrusions of igneous rock, of which very little seen in the sedimentary rocks of this district, and which, in some way was very potent in those parts of Colorado mentioned, in the forming of great ore-bodies. These veins, found in this belt, are thought to be the same as those that cross the slates, but as yet, so very little work has been done that little is known concerning the veins here found, and so far the slates and schists have proved to be the most important ore-bearing formations. Belts of these latter rocks are in parts well interlaminated with narrow bands of quartz, and also crossed in irregular forms by barren white quartz.

Ores and Ore Deposits.

The ore so far found in this district is essentially argentiferous galena, mixed with this galena is more or less tetrahedrite or grey copper, in direct proportions to the amount of which is the value in silver, and on some properties, as the "Silver Cup," etc , good gold values are also carried. More or less zinc blende is nearly always present and often copper and iron pyrites. However, some other variations are seen as on the "Sunshine" and "Great Northern" groups where galena and coarse cubed pyrites form much of the ore, while on the latter lead nearly solid copper pyrites is localised in small pay-streaks, and on the "Great Northern" and "True Fissure" the ore is mostly iron pyrites in quartz, carrying small values in silver, or 12 to 30 ounces, and $1 to $4 in gold. But so far the ore of the district as stated above, may be said to be essentially argentiferous galena, although large veins of slightly mineralized quartz have been staked off, but not exploited as yet, or tested for gold.

On the surface, many of the veins show a large development of white-weathering milky-white quartz, with in some leads siderite or spathic iron, and while much of this quartz may be barren, it is in other parts mineralized or speckled with pyrites and galena which is found often segregated into bands of solid ore, or else so disseminated through the quartz gangue as to form ore that must be concentrated, so that while clean ore can be hand-picked and thus shipped, concentration will be a necessary adjunct for many of the properties. On some claims the galena ore occurs in small veins up to 8 to 12 inches wide of solid material, but much more work is yet essential to demonstrate their persistency or continuance.

As to strike and dip, they nearly coincide with the strike and dip of the enclosing slates or schists, but on closer examination the veins are found to cut across the planes of stratification or with a dip of 45° to 80° from the horizontal.

Transportation.

The transport charges to Arrow Lake are prohibitive, except for very high grade ores, but if sufficient amount of shipping ore is demonstrated to exist it will not be difficult to supply much better and cheaper facilities.

Claims.

The various groups of claims now located are widely scattered, and this year further prospecting is adding to their number, especially on the ranges on either side of Trout Lake and up Canyon and Tenderfoot Creeks, the southern affluents of Lardo River, but although the early locations date back to 1891-92, there is yet a great lack of work which is so necessary for progress, and every effort should be made to develop as much as possible all claims showing veins or leads, for upon this work depends the opening up of this section of country, as men with capital are much more quickly attracted to properties on which work is done, and with the opening up of ore-bodies of pay ore the means of transport will be supplied when tonnage is assured. The advance will be slow if development work is neglected, and will only be proportionate to the efforts made by the owners to prove that their claims promise to become mines.

This year there has not been made the advance predicted, due greatly to the cessation of nearly all work by the Fraser River, Lillooet and Cariboo Gold Fields Co., which proved to be a serious damper, together with the unfortunate fall in the price of silver.

Silver Cup. The *Silver Cup*, *Sunshine* and *Towser*, located on the same lead at the head of Silver Cup Creek, south of the south fork of Lardo Creek, four miles by road and three by trail from Ferguson, elevation 58-6,600 feet, are owned by the Lillooet, Fraser River and Cariboo Gold Fields Co., Limited, or by a subsidiary company. This vein, or rather two parallel veins, about 50 to 60 feet apart, located near the timber-line, N. 50° W., and S. 50° E., and dip south-westerly at an angle of 70° to 80°, apparently coincident, but cutting across the stratification of the enclosing black or carbonaceous slates. On the surface the out-crop is meagre and insignificant on what is known as the "Silver Cup" vein, consisting mostly of very irregular quartz stringers and masses along the course of the vein, and running towards vein "No. 2" or "Free Coinage" vein, which out-crops in several places as a slightly mineralized milky-white quartz.

On the *Silver Cup*, a shaft was begun where the quartz was much mineralized, and sunk 183 feet along a smooth hanging wall, where it connects with a cross-cut tunnel 364 feet long. In sinking this shaft the vein is very persistent for over 100 feet, carrying in places sheets of clean ore 6 to 20 inches wide, and then nearly barren quartz 18 to 30 inches wide. At a depth of 20 feet, a drift 40 feet to the south-east follows the smooth hanging wall, next to which is lying 1½ to 2½ feet of white quartz, next to which is a streak 6 to 16 inches wide, of nearly solid high-grade ore, in which a small stope has been raised leaving ore in the bottom, but showing only mixed quartz and ore in the face of this short drift. Further down the shaft can be seen more clean ore, but practically little or no work has yet been done here, although probably 50 tons of high-grade ore have been here extracted, and at the top about 25 tons was being sorted and sacked, leaving a considerable proportion of concentrating material.

Tunnel.—At 295 feet the tunnel intersected the No. 2 vein where it was 5 to 6 feet wide, with a band of solid white quartz along a smooth foot-wall, and then several bands of nearly clean ore, one of which at the face of the drift, in about 15 feet, was 14 inches wide, but besides this clean ore was considerable very good concentrating ore, all of which was being piled outside on the ore-dump as broken down, from which pile clean ore was being hand-sorted. At the intersection with the shaft, that vein was there very narrow, although the intervening space between the two veins or about 60 feet, the slates were traversed by small stringers of quartz, and sometimes clean ore. But in reality the opening up of this property was just begun, and these drifts, two just about to be started, will give much more idea as to what are the possibilities of these two veins.

Ore.—The ore is very high-grade argentiferous galena, both fine and coarsely crystalline, carrying grey copper, zinc blende and copper and iron pyrites. Since the time of visit, work has progressed rapidly, and the ore-shute is said to be looking very well, and to be nearly continuous along the drifts. Shipments recently made carried the high average of 196.7 ozs. of silver, $8.80 in gold per ton, and 34 % lead. Number of men employed, 35.

Sunshine. On this, the north-west extension of the above claim, a tunnel 340 feet lower in elevation than the "Silver Cup" tunnel, and about 1,000 feet further to the north-west, has been driven for 290 feet south-east, in which, for 50 or more feet, ore 6 to 16 inches wide has been followed in driving the tunnel through which, 15 to 20 tons of clean ore or galena with coarsely crystalline iron pyrites, had been extracted together with a considerable pile of concentrating ore. The new superintendent, Mr. D. G. McNeil, had suspended work on this tunnel.

Towser. On this claim, lying north-west of "Sunshine," a 40-foot tunnel had been driven, without success, to cut the vein, but it was believed that an out-crop of quartz found on the line of the vein was the vein itself, and work was being started to exploit this part of the vein by open cuts.

Free Coinage. This claim, 1,500x1,500, owned by Thos. Dunn and Wm. Farrell, Vancouver, lying south-east and higher up the basin from the "Silver Cup," had a small shaft sunk 12 feet on a small vein of quartz slightly mineralized, thought to be the No. 2 vein in the "Silver Cup" tunnel, and to exploit this claim Mr. Munroe had begun a tunnel to run along this vein and then cross-cut in search of the "Silver Cup" vein.

In this locality the slates or shales below the surface are very black and carbonaceous, and are very evenly bedded, except along the course of the veins, where they are considerably twisted and contorted.

Other Claims. Many claims have been located in proximity to this group of claims, and also as extensions, but as far as could be ascertained very little or no work had been done.

Alpha Group. This group, otherwise known as the "Great Northern" group, lies at an elevation of 5,500 to 6,000 feet along the ridge of mountains between the Lardo Creek and the North Fork of this creek, or about three miles west of Ferguson, or eight miles north-west of the "Silver Cup." By road and trail it is seven miles from Trout Lake City, and by the new trail about five miles from Ferguson. Along the course of this lead have been located, among others, the *Butte*, *Phillipsburg*, *Old Sonoma*, *Broadview*, *Hillside* and *Great Northern*, *True Fissure*, *Silver Queen*, etc , and this lead is distinguished by its great width of milky-white quartz in which, as will be detailed, work is in progress in search of bodies of galena ore which is here not of so high grade in silver, or probably 30 to 40 ounces per ton.

Broadview. The Lillooet, Fraser River and Cariboo Gold Fields Co., Limited, has secured the *Broadview*, *Old Sonoma*, *Phillipsburg*, the fractional claims the *Clipper*, *Skipper*, and *Skiff*, and the *Alpha*, *Confederation*, and *Colonial*, and on the Broadview was being, in July, concentrated all development, as here there runs throughout the claim, nearly conforming with the strike and dip of the enclosing slates and schistose sedimentary rocks, the great thickness of white-weathering quartz, for the most part only slightly mineralized. Where exposed by stripping, on the surface there are seen a main band of quartz, 30 to 40 feet wide, and then lesser bands of quartz with country rock between, and parts of the larger body of quartz contains considerable siderite, near which, in some of the workings, are found both solid and mixed ores, and in one of the tunnels a narrow band of siderite, galena, and blende had been followed. So far, the limited workings had not penetrated the vein beyond the point where surface agencies have been very potent, as the ground was very much shattered, the sulphides were much decomposed, and the work had not time to advance far enough to demonstrate the characteristics of this large quartz lead, or to show up the existence of ore other than that found in the upper workings.

Ore. In the shaft was found solid ore of coarse cubed galena, with considerable zinc blende and iron and copper pyrites ; also, as well as in some of the other openings, a considerable amount of this mixed ore and quartz that might be suitable for concentration, while much honeycombed quartz, becoming, when undecomposed, quartz impregnated with very coarsely-crystalline iron pyrites, such material, it was claimed, carrying small gold values. Elsewhere, in some of the tunnels, were being found narrow stringers, 2 to 10 inches wide, of nearly solid copper pyrites, and also small stringers of solid iron pyrites assaying high in silver. Strike of vein, west of north, east of south ; dip, 45 to 60 degrees easterly.

Shaft on summit ; elevation, about 6,000 feet. Here the lead is 30 to 40 feet wide of quartz, carrying a good percentage of siderite and iron pyrites which, on decomposition, has become a very honeycombed sintery mass. A shute or band, 20 to 30 inches wide, of the solid galena-blende ore was here found, and a shaft was sunk for 25 to 30 feet along this ore when the quartz and pyrites came in, and continued to the bottom, 118 feet down, and also in a wide drift run along the vein for 50 feet at the 50-foot level. No further work is being done at this point, but, from the pile of ore extracted while sinking in this shute of galena ore, clean ore was being sorted and sacked for shipping.

Tunnels. (*a.*) *Fifty-foot level*, or 75 feet lower down the hillside than the collar of the shaft, and several hundred feet northerly, runs southerly 186 feet, passing for most of that distance schists and quartzose material, but encountering a narrow band of mixed galena ore, in which, at 135 feet, a winze has been sunk 25 feet, this ore being now piled in the tunnel, on which work has been stopped.

(*b.*) *Hundred-foot level*, 100 feet below tunnel (*a*), was originally run in 112 feet along very quartzose but barren slates and schists, and through much white valueless quartz ; but Mr. McGuire, on assuming charge, discontinued this work, and, going about 100 feet easterly, stripped the surface, exposing a wide band of white quartz, then parallel bands 4 to 6 feet wide, with country rock intervening, and along near the foot-wall of this large band a tunnel was being driven, in 100 feet, July 24th, in badly crushed ground, having followed for some distance a stringer, 5 to 8 inches wide, of nearly pure copper pyrites.

(*c.*) *Two hundred-foot level* was just being started near the foot-wall side of a large exposure of barren white quartz.

(*d.*) *Three hundred-foot tunnel*, probably 1,000 feet north of the shaft and 400 feet lower in elevation. At the beginning of this work considerable mixed ore of low grade was found in the open cut; then the tunnel was run 60 feet south-east in white quartz and spathic iron, but with no ore, so Mr. McGuire came back to near the entrance, and is running south 15° east, 85 feet, July 24th, along a smooth wall in white quartz following a small leader of ore.

Hence not much or no pay ore has yet been discovered on this claim, as the silver values are too low, and while development work had only begun there were all the evidences of a very strong lead, of which the ore-bearing possibilities might prove good, but all work was stopped last summer and nothing further is being done on these claims.

Transport. By the new trail 200 tons were to have been hauled out to the company's depôt on the main waggon road near Ferguson, and thence shipped by waggon to the steamer landing at Thompson's Landing. If the property were developed, and a sufficient amount of concentrating ore found, an ærial tramway might be run down to the mill-site on Lardo Creek above the depôt, near which passes the surveyed line of the proposed railroad from Arrow Lake.

At the depôt large and commodious log cabins, stables, etc., had been erected from which supplies could be sent to the properties here under control of the management. At the mine sufficient cabins have also been erected. In Lardo Creek is an ample supply of water under a good head for milling purposes.

Old Sonoma. Lies immediately on the southern extension of the above claim, and in a small shaft 25 feet deep with a 50-foot drift is seen a small amount of quartz carrying a little galena and iron pyrites, while a tunnel has been driven 203 feet, but with the disclosure of no ore. No ore yet found on the *Phillipsburg.*

Great Northern. These claims lying between the "Broadview" and "True Fissure," D. McPherson, Trout Lake City, have the surface well covered with wash or detrital matter, but four cross-cut tunnels, now badly caved in, have been run in towards this large quartz ledge, at the lower one of which the dump consisted of black carbonaceous slates and white quartz with traces of galena, while from an upper tunnel a large amount of quartz and iron pyrites had been extracted, from which 17 tons were sorted and sent to the smelter in 1896, the returns for which are not known.

In another tunnel a little higher up is an exposure of quartz with a large amount of iron pyrites carrying also galena and zinc blende. No work was being done at time of visit, and the condition of the tunnels precluded any proper underground examination.

True Fissure. On this claim, for a wide area, the slates and shales have been eroded leaving a large exposure of the white quartz that must be from 20 to 40 feet thick along the steep hillside.

In one shallow cut was seen considerable siderite with a little galena, and below this a cross-cut tunnel has been driven 94 feet in which about 20 feet of solid white quartz, carrying fragments of slate, some iron pyrites and very little galena, were first cut, beyond which the tunnel ran through crushed and contorted black slaty material crossed and seamed by stringers and masses of barren white quartz along which a drift is in 22 feet. From the quartz-lead assays of $8 to $22 in silver were obtained by Mr. McGuire. Farther to the north the surface dirt has been cleared off this large exposure of quartz, and a short tunnel of ten feet driven in, and here, on the upper or surface part of the ledge, can be seen much nearly solid iron pyrites 1½ to 2½ feet thick, under which lies a narrow parallel band of fine galena scattered through the quartz, below which again are 3 to 5 feet of siderite and quartz with irregular masses or blotches of iron pyrites, underlying which, is the barren white quartz with fragments of country rock, the dip of these bands, *i.e.*, of the ledge, being 45° easterly. From a pile of nearly pure pyritous ore, here fair assays in gold and silver are reported. While a large amount of this quartz ledge matter is thus exposed on this property, the very little work yet done has not exposed any body of pay ore nor concentrating ore, although from material taken at the north end of the claim assays of $4 in gold and 10 ozs. silver per ton have been got by assaying. All work has been suspended here.

Silver Queen. This claim, north of the "True Fissure," has had some work done on the continuation of this lead.

Commonwealth Group. These claims, the *Glenside*, *Vera* and *Tom Thumb*, are on the North Fork of the Lardo, but were not visited. However, a Brandon company were developing this property on which was said were two, perhaps more, veins of quartz and galena that might prove to carry concentrating ore.

The *Horne* lead was not visited, as nothing was being done except some assessment work on the claims located for miles along the supposed trend of a large lead of quartz and galena with low silver values, which is said to run in parallel stringers on the North Fork of the Lardo Creek.

Blackburn, 2,500 feet south of the above lead, is very little developed. Some low grade galena showing.

Glengarry, on Silver Tip Creek, a tributary of the Duncan, and on the divide between this and Boyd Creek. The trail runs up Fish Creek to the claim located high up among the glaciers, and although very little work has been done, there is said to be a wide six-foot quartz lead carrying some galena, although in one place a foot wide of clean ore is showing.

Gainer Creek.

Circumstances were such that this creek was not examined, although two attempts were made and time was limited.

Badshot.

Elevation about 7,500 feet, 5 or 6 miles up Gainer Creek. F. Campbell and F. Johnson own this claim, and the adjoining *Pine Tree*, and three other claims. This property is located along the contact of the up-tilted schists and the "lime-dyke" or limestone belt, and in the limestone is a small vein of argentiferous galena, on which several assessments have been done.

Other claims near here are located on small galena stringers.

Black Prince, owned by Mr. Yawkee, *et al*, lies along this same line of contact, south-east of the "Badshot," but on the opposite or east side of Gainer Creek. It was stated that a 150-foot cross-cut tunnel had been driven to intercept a small vein of galena in the limestone, occurring more as small stringers. Located high up and accessible only by a very steep trail. No work being done.

Pathfinder Group, lying S.W. of "Black Prince" group, and owned by McCollough and Brewster. In the slaty formation, not far distant from a porphyry dyke, are found stringers of quartz, and galena said to carry very good silver values. A cross-cut was being run along one of these stringers towards this zone.

Molly Mack, three miles up Gainer Creek. Some work was being done to prospect some ground where some quartz, iron pyrites and a little galena were showing.

Silver Chief, 4.5 miles up Gainer Creek, near summit on the east side. Mr. Hugh Stewart was said to have 9 men at work developing two small 8 to 10 inches of steel galena.

Hotel at 10-Mile.

A small hotel was opened at the confluence of the Lardo and Gainer Creeks, which made a convenient stopping place *en route* up Gainer Creek or to Wagner Group.

Wagner Group.

This group, or the highest mine in the Province, elevation 8,200 feet, lies on the summit between Cariboo and Hall Creeks, and thence extends south-east down the gully below the glaciers, across the head of Hall Creek Gulch to the summit separating this gulch from that one occupied by the Abbott group and drained by a stream into Healy Creek, Hall and Cariboo Creeks, flowing into Duncan Lake, or in the other direction.

The Selkirks here are very grand—the lofty, craggy peaks towering above gigantic glaciers, while the steep mountain sides are scoured in places by avalanches or snow-slides, yet near these summits have been made discoveries of silver-galena deposits, especially near or at the line of contact of schists and slates, with the great tip-tilted band of marbleized limestone or "Lime Dyke," that stands up prominently for many miles with towering, precipitous, naked sides and castellated crests.

The claims, the *Lardo*, *Duncan* and *Ella*, each 1,500 by 1,500 feet, are owned by Messrs. W. G. Johnson, W. S. Rugh, C. T. Porter, *et al.*

On the *Duncan* claim on the top of the ridge, at an elevation of over 8,000 feet, a small knob or boss of slate or schists, rises from the perpetual snow and ice. A zig-zag trail leads from the tents (elevation 6,500 feet) up to these glaciers, and then across this solid mass to the tunnel, which here enters and passes along a smooth wall of white quartz of a large and strong ledge, the out-crop of which runs up and over this knoll.

This out-crop consists of a wide mineralized zone of bands of quartz, galena and irregular bands of slate nearly coincident in strike and dip with that of the country rock. Strike, north 50° west; dip, south 40° west 70°.

There is much barren quartz, but there is also much carrying a good percentage of galena with good silver values that, under the proper circumstances, may prove good concentrating ore. This zone is 30 to 40 feet wide of mixed rock matter and ore with bands of clean galena 3 inches to 2 or 3 feet wide.

The *tunnel* follows along a smooth quartz wall with a nearly continuous streak, 2 to 20 inches wide, of clean, fine-grained galena shows in the roof, 100 feet to the face, and two cross-cuts to the left, 8 feet long, are still in quartz carrying a very good percentage of galena, a little iron pyrites and zinc blende and tetrahedrite, hence the width of this ore-body in the tunnel was not disclosed. Since time of visit a winze has been sunk 80 feet showing, it is stated, about the same conditions.

The method of working this property and the transport of the ore down to a concentrator will present some unique features, as the workings and ærial tramway would have to be located so as to be safe from snowslides, but much more work is necessary before such are considered, to determine the extent and value of this interesting vein.

This ore will, in every probability, have to be exported *via* Hall Creek and the Duncan River, as the trail from Ferguson, about 24 miles long, is a hard one and climbs over two divides. There is little or no timber upon these mountains except down in the valleys, and fires have burned over a lot of ground.

The owners think there are indications of this ledge below the lower limits of the glaciers, but no tests have been made to verify.

Francis Jewell. This claim and the *Queen Mary*, *Princess Marie* and *Lucille K.*, owned by C. T. Porter, W. S. Rugh, *et al*, lie as the north-east extension of the "Wagner" group, and in a 30-foot tunnel on this claim has been found a vein of quartz, galena (silver-bearing) and grey copper. In the gulch just below the "Wagner" claims, and on the *Queen May* and *Princess Marie*, extends for about 500 feet, a strong vein of banded, coarsely crystalline quartz, 10 to 15 feet wide, very slightly mineralized with pyrites and galena. Practically no work has been done on this exposure, nor have any values been found, but this may yet prove to be important and significant.

Other Claims. *Laura J.* and *Ward* lie along the steep face of the slate cliffs parallel to the Wagner vein, and a narrow vein of silver-bearing galena can be traced for a considerable distance, assessment work on which is said to have given very favourable results.

Death-on-the-Trail, *Little Tommy*, *Bell Flower*, etc., owned by the Duncan-Lardo Mining Co., were recently located on stringers of galena in the slates underlying the limestone of the "Lime Dyke." Assessment work was being done.

Abbott Group. The *Abbott*, *King William* and *Marion* lie south-east of the "Francis Jewell," in a large basin, drained by a branch of Healy Creek. On the "Abbott" claim there is said to be a small vein of about 20 inches wide of galena high up on the steep side of the "Lime Dyke," to tap which a tunnel was being driven (now in about 300 feet) until two men were killed in a snow-slide, since when no work has been done.

Bannockburn Group. This property lies up in the high basin east of the "Lime Dyke" to the south of and about 1,000 feet above Hall Creek. Three galena veins are reported, but only a few shallow surface cuts have been made to develop. This galena is said to carry medium silver values, one assay returning 35 ozs. silver, about $5 in gold per ton, and 70 % lead.

CARIBOO CREEK.

Prospectors were busy during the past season up this creek, which lies westerly from Hall Creek, and important finds were reported on claims staked off on both sides of the "Lime Dyke.'

LARDEAU DIVISION.

No attempt was made to examine this district to the north-west of the Trout Lake region, as very little work has been done, and no account could be obtained of any important discoveries made as yet. This region is said to be very mountainous and trails are scarce, although one leads up Fish Creek for several miles. Some prospectors were entering this district by the way of Ferguson.

Returns from Mining Recorders.

Details.	Ainsworth.	Arrow Lake.	Goat River.	Nelson.	Slocan City.	Slocan.	Trail Creek
Number of Claims recorded	1,982	252	372	2,097	312	1,489	1,864
" Certificates of Work	968	......	105	1,502	311	1,078	1,627
" Certificates of Improvements	.....	......	2	22	......	104	160
" Bills of Sale, Transfers, etc.	1,312	169	138	1,356	224	1,537	1,507
" Abandonments	......	2	......	20	......	12	99
Free Miner's Certificates	1,798	300	143	2,288	136	2,366	1,699
Money paid in lieu of work	......	......	2	14	.....	20	28

LILLOOET DISTRICT.

A short visit was paid to the town of Lillooet, in order to visit a few of the properties on Cayoosh Creek that had attracted much attention by the discovery of fine samples of quartz and free gold. The town of Lillooet, one of the oldest in the interior, was an important point in the early days of Cariboo, as it was on the main line of travel thither until the road was built in from Yale and Ashcroft. It is beautifully situated on the west bank of the Fraser, above the confluence of the Cayoosh Creek and the river flowing out of Seaton Lake, and below that of Bridge River, and is noted for its very equable climate, many kinds of fruit being grown on irrigated land.

An excellent road runs from Ashcroft through the Marble Canyon and then along the Fraser River, a distance of about 70 miles, and another road is being built from Lytton along the east bank of the Fraser. A road leads to Seaton Lake, and then up Cayoosh Creek to the "Golden Cache" and other properties, and a trail has been opened up along Bridge River.

During the past season, many prospectors have been busy, as stated below in Mr. Sones' report, in the country about 60 or 70 miles up Bridge River, where is a very large extent of country hitherto little known even to the prospector, with even greater areas, perhaps, not yet explored. Gold-bearing quartz ledges have been located, on which some work has been done and much more is about to be done, and during the coming season the field of exploration will be very much more extended, as trails and other means of ingress are provided. Geologically, practically nothing is known of this region, but on Bridge River, where most work has recently been done, the formations are said to consist of eruptive rocks of different kinds.

For many years, the bars and benches on the Fraser, Bridge River, Cayoosh and other creeks have yielded gold, but very scanty attention was ever paid to the sources of this gold or the quartz leads until the discovery of the "Golden Cache" lead proved a great incentive to much greater and more extensive prospecting for quartz veins, although work had been done several years before on the quartz veins on Cayoosh Creek, as on the "Bonanza" claim. This awakened interest will lead to the opening up by trails and to the exploration of a large region here on the eastern slope of the Coast Range.

Value of Assays.

In a former report, considerable was written about the value of assays of quartz carrying free gold. To everyone familiar with gold-quartz ores, it is known that fire assays on this class of material are almost always valueless, in that a series of assays made of the same sample is very likely to give most variant results, and it is very difficult to thus determine the average values of the ore in such a lead. It is very easy to get wonderful returns from picked samples so as to astonish the inexperienced public, who do not know that an assay may not always be true, but very misleading, and such assays are many times paraded to tempt purchasers.

The system of averaging a lot of assays that may run from zero to high values is both erroneous in principle and pernicious, as, while zero assays may be near the average value of the ore, the chance high returns from picked or exceptionally good samples will be sure to give high but utterly fictitious results. This method of taking the average of the assay values from a number of samples from a vein is often pursued, but not by men experienced in valueing gold-quartz, and it is an old story that mill returns are so many times disappointingly lower than these so-called average assays.

Hence the point wished to be made is that assays of quartz with free gold should be accepted with very great caution, it being kept in mind that such assays may only serve to demonstrate the presence of gold in the rock, but not what values the mill may return when large lots are treated.

CAYOOSH CREEK.

Golden Cache.

The Golden Cache Mines Co., Vancouver, capital stock $500,000 in $1 shares. Superintendant George T. Rives, Lillooet, owns the following claims:—"Golden Eagle," "Ruby," "North Star," "Golden Stripe," "Moonlight" and "Intermediate" fractions, located on the steep mountain sides north of Cayoosh Creek, twelve miles from Lillooet, and the "Jumbo" on the south side.

Topography.—The country traversed by Cayoosh Creek is exceedingly rugged, the mountains being very precipitous and lofty, many of the clifly sides being vertical, while the creek runs through a deep and narrow gorge.

When this lead was discovered by a half-breed hunter, this country was almost too difficult for access even by a very bad trail. Now a fair waggon road with very steep grades both ways, has been built from Seaton Lake 10 miles up along the steep mountain sides, often crossed by rock slides, to the site of the stamp-mill on Cayoosh Creek, where the three-rail gravity tramway leads up to the foot of the ore-shutes below the perpendicular face of rock, in which is this body of quartz.

The Mine.—At the time of visit all entries to this mine were blocked up with ore awaiting the completion of the mill, hence the underground workings could not be seen. However, near the summit (*see* illustration) of a nearly vertical bluff, and in the face of this bluff at a height of about 1,700 feet above Cayoosh Creek, running diagonally across with a pitch to the north of about 20 degrees, was seen the ledge traceable for about 450 feet, or a lens-shaped body of quartz about 20 feet thick at the centre, and narrowing down to a narrow stringer at either end. It was claimed that the vein could be seen again along the trend of this vein, as on the "Alpha Bell" on one extension, and the "Golden Stripe" on the other, but this was not traced out.

This lead dips into the mountain at an angle of about 12 degrees from the horizontal, but when in a distance of about 100 feet, where there is a winze 28 feet at the end of a tunnel, the dip is said to suddenly become much steeper, but not enough work had apparently been done to disclose just what the conditions are at this point. The vein is apparently conformable with the enclosing black argillite-schist, and while the main mass consists of bands of milk-white, barren-looking quartz, there are broad and narrow bands of quartz interbanded with a little slate, the whole mass being twisted and crumpled.

Gold.

Very fine samples of free gold have been taken from this ledge, but in the main body nearly all of the central mass appears to be very barren, while most of the gold is said to be in two or three feet of quartz near the foot and hanging walls. Free gold is visible in many samples, but generally along the narrow seams or lines between the bands of quartz where there is also black, carbonaceous matter from the slates. But gold is seen both in the solid quartz and in the slates of the walls.

The proper development of the mine has just begun, and it is yet impossible to say what values this large body of quartz may carry in gold, but so far the returns from several hundred tons treated in the stamp-mill have been disappointing, or very much lower than were anticipated by the owners, the returns for 755 tons first crushed being about $4.45 per ton. The amount of sulphides in this ore is extremely small so that the amount of concentrates will be practically nil, unless in depth the quartz carries more sulphides.

In working the first openings into this body, it was very difficult to get at it on the bare surface of the cliff, but Mr. Rives now has a strong platform built with a short 3-rail tramway to the head of the shutes that lead down to the main tramway.

Mill and Tramway.

A three-rail gravity tramway leads from the mill up to the ore shutes, or to a point 270 feet below the ledge. It is 2,200 feet long with a drop of 1,100 feet, and has a ¾-inch steel cable, with a 2-ton car on each end. According to the first designs and contracts let, the lower end of this tramway was so low that no allowance was made for the dumping of the car at the mill, so that after a short mill-run had been made to satisfy one of the largest purchasers then at the mine (and just at the time of the writer's inspection), the mill was stopped until the lower end of the tramway could be raised to permit the car to dump automatically. The cost of this tram was about $10,000.

The mill, built by the Wm. Hamilton Manufacturing Co., L'td., Peterboro, Ont., at a cost of about $10,000, consists of two batteries of five stamps, each 850 lbs., dropping 6 inches, 96 times per minute, with inner copper plates, back and front, and outer coppers 4 by 8 feet, and 40-mesh slotted screens; Reliance Blake crusher above an 180-ton bin; two Reliance feeders; two, 4 by 12 Frue Vanners; one, 90-h.p. engine, and one small 5-h.p. vertical engine for vanners; 1 boiler; saw-mill and planer; steam pump at creek.

This mill, built on the bank of the creek, can easily be enlarged to 20 stamps; Cayoosh Creek carries a good supply of water and a fine water-power can be got a quarter of a mile below the mill, where electric power and air compressor plants may be installed, but until the true value of this ore-body is accurately determined by the present mill, further erection of plant, etc., will be very inadvisable.

This property attained a very sudden and far-reaching notoriety, by reason of the fine specimens found, and it is sincerely hoped that this large body of quartz will yet be found to carry high enough values to permit remunerative returns.

Excelsior.

The Excelsior Gold Mining Co., L'td., Vancouver; Secretary, Jas. D. Byrne, owns the "Excelsior" claim, lying along the mountain side, southerly from the Golden Cache claims. A tunnel had been started in the steep hillside on a vein 2 to 10 feet wide, of bluish-white quartz free of sulphides. This vein runs diagonally up the mountain side, and is exposed for about 600 feet. The tunnels runs level, N. 70° W., for 25 feet when the vein begins to dip westerly on a dip of about 15 degrees, changing at 50 feet to 30 degrees to the face or 120 feet from the entrance. There is a large amount of this white, hackly quartz showing all the way, but towards the end of the tunnel it is intermixed with some slate. Some good assays in gold have been obtained from some of this material, but gold is seldom found on making panning tests. Cabins were being built, and five men were at work.

The *Alpha Bell* claim, on which in the steep face of a high bluff a small vein of quartz is reported a short distance north of the "Golden Eagle," was not visited, nor the "Bonanza" where no work had been done for some time.

Cayoosh Creek Mines, L'td.—This Company, Secretary F. Robertson, Vancouver, had secured five claims on the opposite side of Cayoosh Creek from the Golden Cache properties, and Mr. Valleau was doing some work to prospect some small showings of quartz situated about 1,000 feet above the creek.

REPORT BY MR. F. SOUES, GOLD COMMISSIONER, CLINTON.

"The total yield from the District (ascertained from reliable sources only) is $39,840, an increase on the yield of last year, but still far below the average of former years.

"Mr. A. W. Smith, of Lillooet, is again the largest buyer of gold and, in response to my application to him for statistics, he writes: 'I am sorry that I have to report to you that the gold yield of this section is steadily decreasing. During 1897 I only bought $22,600 worth. Fraser and Bridge Rivers produced most of it. I am unable to form any estimate of the number of miners engaged in producing it. I think about $500 is the result of white labour, about $1,000 Indian and the balance Chinese.' Mr. Smith's estimate of who were the producers in the neighbourhood of Lillooet may be taken as a fair estimate of the District.

"This year may be characterised as one of fevered and profitless excitement, with an indiscriminate staking and recording of alleged mineral claims, in total disregard of the sanctity of an oath and the requirements of the Mineral Act, working incalculable harm to the mining future of the District.

"In the monthly returns received from Mr. Phair, Mining Recorder at Lillooet, I find that in the first three months of the year 201 claims were recorded by him, principally on Cayoosh Creek and immediate neighbourhood. The information given to Mr. Phair by the parties making these records set out in glib terms the nature of ore, the nature of foot and hanging walls, average width of seam, distance of seam traceable on surface, etc., etc., and at the same time the whole of that part of the District was covered with from one to four feet of snow. It is safe to say that not over 5 per cent. of these claims have had any development work done on them, and meantime numbers of them have been sold.

Quartz.

"In this class of mining the scene of excitement has changed from Cayoosh Creek and Blackwater to the upper waters of the South Fork of Bridge River and tributaries. The Blackwater claims may be dismissed in the meantime with brief notice. They may be very valuable, but there has been no attempt at anything like actual development.

"With regard to the various claims on Cayoosh Creek, I am advised that development work to the extent of $1,000 each has been done on the 'Mineral Point,' 'Eagle's Nest Group,' 'Tug of War Group' and 'Ample Group,' while work has been continued on the 'Golden Cache Group' throughout the year.

"The president of the 'Alpha Bell Company's' claims on Cayoosh Creek reports that, '235 feet of tunnelling have been run on different ledges, some of which have assayed very high, while others have averaged low. As, however, none of the tunnels are in over 60 feet, we are of the opinion that with depth the ledges will gain in value. We think this especially the case with the tunnel on the 'Surprise' claim, which has exceeded our expectations, having assayed up to $1,000 per ton. Three of the ledges on our Cayoosh Creek property are still untested.'

"Mr. Jensen, superintendent of the 'Excelsior Gold Mining Company,' reports in regard to the 'Excelsior' mineral claim, situated on the north bank of Cayoosh Creek, and about 1,000 feet above the creek: 'Active development commenced on the 1st of May last, and has been continuous up to the end of the year. The ledge shews on the surface for a distance of 700 feet, foot wall, slate; hanging wall, conglomerate. A tunnel was run on the ledge where it was 6 feet wide on the surface, and it increased to 9 feet wide at 163 feet, the inner end of the tunnel. The character of the rock is free-milling white, to white and blue quartz with fine veins and seams of talc. Assays made during the progress of running the tunnel gave from traces to $177 per ton in gold.'

"No work has been done on the 'Bonanza' group of mines during the past year.

"A passable road has been made from Seaton Lake to the Golden Cache Co.'s claims and available for all the claims on Cayoosh Creek. This road to a great extent in its entire length is practically a narrow shelf along the deep mountain sides. Unnumbered engineering difficulties were in the way of its construction, and it still requires a great deal of improvement, which is a matter that can safely be left with the Department of Lands and Works.

Bridge River.

"I am very much pleased to be able to report that rich gold-bearing ledges have at length been found on the upper portion of this river and its tributaries south-west from Lillooet about 70 miles. The various samples of rock I have seen may be described as a white sub-translucent quartz, carrying native gold, with considerable iron and possibly arsenical pyrites, and a notable absence of the grey chloritic schists universally accompanying Cayoosh Creek quartz. The 'Forty Thieves' group of mines, on the South Fork of Bridge River, was located in July, 1896, and the manager, Mr. Williams, reports to me, under date 21st inst., that :—'The vein is a true fissure, averaging about 4 feet in width, situated in a syenite formation with a small streak of porphyry on the hanging wall, and exposed to the depth of about 400 feet. The ore consists of free milling gold-bearing quartz, with traces of copper and silver. The outcrop is traceable for 6,000 feet, with a strike S.E. and N.W., and the dip is 64 degrees.' The 'Ida May' group, embracing three locations, was located in August and September last, and is situated on Cadwallder Creek, and is now owned by the Alpha Bell Gold Quartz Mining Co. The president of this company, Mr. G. E. Bower, reports to me that 'the work done shews a well-defined fissure vein, 3 feet wide, cased with dioritic slate on the hanging and porphyry on the foot wall. The trend of vein is N.E. and S.W., dipping northerly at about 15 degrees. We have stripped the vein 40 feet, and it shews free gold as far as stripped. A tunnel has been driven at the north end of the stripping for 50 feet, following the slope of the vein, in which a continuous ore shute shewed for the whole distance down. According to assays, the average value across the ledge is $40, though we have had very high assays not included in this average. The vein contains about 5 per cent. of sulphurets, carrying high values, which can be saved by concentration and chlorinated on the ground. The 'Ida May' is the only claim that is developed to any extent, but the surrounding prospects are apparently of the same character. From the open cuts made on them, we find that there is a free-milling belt from 10 to 12 miles in length, running parallel to Cadwallder Creek and the South Fork of Bridge River'.

"The result of these discoveries is that the prospector has for the time being abandoned Cayoosh Creek, and his whole energies are now devoted to the immediate neighbourhood of the 'Ida May' and others. Mr. Phair advises me that he has entered record of 55 claims on Tyauchton Creek, 175 on Cadwallder Creek, and 190 on Bridge River and South Fork.

"As stated in my report of last year, I am not aware that this portion of the district has ever been visited by any of our eminent geologists, and of the geological conditions nothing whatever is known. Sufficient for me at present is the fact that the whole of the Bridge River section is situated on the inner slope of the Coast Range, and while it may not have been subjected to the same dynamic ordeal that has taken place in the valley of Cayoosh Creek, I have no doubt it has to some extent been roughly shaken, veins contorted and broken from perpendicular to horizontal and general dislocation of the strata. I would also infer from Mr. Bower's report, as to the quantity of sulphurets, that there is the chance of the ore changing with depth from free milling to rebellious, and would urge on the owners of all the claims in that neighbourhood thorough and exhaustive exploration and development under skilled management before going to the very great expense that may be incurred in placing heavy machinery in, at present, a very inaccessible portion of the district.

"I regret that so far nothing in gold-bearing quartz has been discovered on the Lower Bridge River in the neighbourhood of the North Fork and Horseshoe Bend, and trust that prospectors will, in the coming year, give this section more attention.

Bonaparte River.

"The mania for staking off claims extended to this part of the district, and in March and April over 60 claims were recorded by me, the greater proportion supposed to be on some imaginary line with the claims being developed by the B. C. Development Co., and the owners of the 'Maggie.' Needless to say that nothing worthy of a certificate of work has been done on any of them, with the exception of the last two named, and the 'Mountain View' group of five claims. The B. C. Development Company is a development company in the true meaning of the word, at least so far as their claims on the Bonaparte River are concerned. I wish there were many more such in my district, and their position at present requires extended notice.

"In July, 1896, the Company located 8 mineral claims on which, principally on one claim, active exploration and development has been continued ever since. After survey of these claims last spring, they recorded 4 fractional claims. The principal work has been done on the 'Avoca' claim, and under the superintendence this year of Mr. L. W. Farish, M. E. It is refreshing to pass through the underground works of this mine, and note everywhere the evidence of a master mind guiding and directing everything, and in such marked contrast with the underground work in other mines in this district. In the 'Avoca,' in tunnels, air shafts, and winzes, there are nearly 2,000 lineal feet of excavations, and at the present writing development is being actively prosecuted. Mr. J. R. Mitchell, the general superintendent, reports to me that: 'The country rock is a fine-grained porphyry, the feldspar may be anorthite. This band of rock, which may be termed a dyke, is about a ¼ of a mile wide, its out-crop can be traced very readily for a distance of 2 miles. The rock is very much shattered, and there is a great deal of pyrite in the fractures. On the 'Avoca' claim a lode has been discovered which is from 6 to 12 feet wide, having an easterly and westerly trend, and dip to the south at an angle of 75°. The ores that have been found in this lode are copper in various forms. At the surface the ores were chalcanthite (sulphate), malachite and azurite (carbonates). At a depth of 60 feet the ore is tetrahedrite, with occasional pieces of chalcopyrite. These ores are found in veins from 2 inches to a foot in width in the lode, the gangue of which is quartz.' A recent shipment of several tons of this ore for a test smelting, gave satisfactory results. The veins of tennantite or sulpharsenite of copper, occurring in this ore, when freed from all gangue matter, give returns of 41.51 % copper, and 69.5 ounces of silver per ton of 2,000 pounds. The company has expended between twenty and thirty thousand dollars in development, including cost of surveying. In addition to this amount has to be added the price paid on application for Crown Grants, viz.:—$2,300. The whole of this group of claims is within the railway belt, and so located, cost $5 per acre. They have worked on in the most quiet and unobtrusive manner, and although within a few feet of the waggon road, their presence in the district is hardly noticed.

"From Dr. Dawson's report on the general features of the valley of the Bonaparte, from Hat Creek to Mundorf's, and the practical knowledge gained by the explorations of the B. C. Development Co., and a few others, I would infer that the rocks in the whole of this region, where mineralized, are principally cupriferous and argentiferous, with a small amount of gold. The lodes carrying these minerals are, as a rule, at a considerable depth, and will require careful management, and the expenditure of much capital to reach them. No doubt the lode in the 'Avoca,' to which Mr. Mitchell refers, is sufficiently mineralized and of ample dimensions for concentration, but this will necessarily require the expenditure of a large amount of money in the erection of reduction works. On the eastern side of the Bonaparte, and above Scotty's Creek, geological conditions are different, and free gold bearing ledges may exist, but so far none have been located. Fourteen mineral claims were located on Mahood Lake and Mountain in the early part of the year, but there has been no development done on them. Two claims were located on Dog Creek, on which work has been done, but I am not aware to what extent.

"On the Big Slide nothing has been done during the past year. On seven claims supposed, to be extensions of the Big Slide lode, development work has been done sufficient to justify the issuance of certificates of work in each case. By the failure of the first quartz mill erected, and mining done in 1886 on the 'Big Slide,' and the result of the recent preliminary test by the Golden Cache Co. on Cayoosh Creek, quartz mining and milling in this district have received a serious check.

Hydraulic Mines.

"With the exception of the Lillooet Hydraulic Mining Co. this class of mining is still in the preliminary stage. I have good reason to believe that the whole of the locations held by the Bridge River & Lillooet Gold Mining Company on the Horseshoe Bend will pass to an English company this coming year, when active work on a large scale will be commenced.

Dredging.

"I am very glad to be able to report that the question of dealing with the débris under the waters of Fraser River has at last been partly solved by the New Fraser River Gold Mines Co. This end has been attained by determined perseverance, and the expenditure of a very large amount of capital. Mr. W. F. Gore, the General Superintendent for the Company, in response to my request for a general report, writes to me on the 24th inst.: 'We have made dredging a known quantity and an absolute success, not through the medium of any new invention, or combination of patents, but through the operation of a harbour dredge of the kind known as the Dipper Dredge, which was built to our order by the Marion Steam Shovel Co., of Marion, Ohio. The dredge lifts one and one-half yards of material at a time, thus enabling us to wash from a thousand to twelve hundred yards of material per day. For sluicing purposes we have two direct connection centrifugal pumps, which raise about 7,500 gallons of water each per minute. These discharge into hoppers above the grizzlies, and the sluices and usual riffles do the rest. To my mind it is one of the neatest and prettiest mining operations ever conducted. The scow or vessel on which the machinery is placed is 82 feet by 38 feet. The boilers are 80 to 100-horse power, with engines powerful enough to lift 55 tons.' In a personal interview with Mr. Gore since receiving his report he informed me that the vessel and machinery were finished about the end of October last, and they hauled out into the stream for a test and to smooth bearings. Everything worked to perfection; the dipper went under the water and came up full, bringing to light a number of curios, as corroded nails, files, pick points, which go to show that they were then on the site of ground that had been wing-dammed over 20 years ago, and the summer floods of all that time had been unable to move these relics but a very short distance at most. Mr. Gore also handed me specimens of micaceous iron and small nuggets of water-worn copper, found in the general débris. He also informed me that water-worn boulders of lignite coal are found there. The gold result here was a few ounces. Everything being a success they hauled up stream and commenced work in earnest in the early part of November last, when cold weather set in and with the result that the river fell suddenly and they found themselves high and dry, with the exception of the trough which the dredger had dug for itself. The cold had become so intense that they could do nothing with the contents of the sluice boxes, and the whole of the washed material is still in the boxes and likely to remain there for the next two months. Mr. Gore said that it is the intention of the company to add an electric light to their plant and run day and night and, in future, haul into winter quarters at the beginning of November, as they have had sufficient experience now of the very uncertain winter weather that may prevail at Big Bar.

Both Mr. Gore and Mr. Davidson, the mechanical engineer, assure me that they are perfectly satisfied that they can handle the gravels in the Fraser River. All they ask is that there shall be a little gold in the gravel. The gravels last worked are from 3 to 4 feet thick, resting on a stratum of hard pan. By way of testing the dipper, they passed it through the hard pan until they reached another stratum of gravel, consisting of small water-worn stones. In addition to gold in the gravel, I have no doubt platinum, and the other members of the platinum group, will be found (I know that platinum is found in the river gravels at Big Bar, and also on some of the bars below Lillooet). This company is eminently deserving of success, they have had to deal with innumerable obstacles, as usual in commencing an enterprise of this nature. The lumber for the construction of the vessel and buildings had to be cut from the nearest forest, and hauled over a rough road to the place where the building was done. All the machinery, some of it very heavy, such as the boilers, had to be hauled from Ashcroft over the greater part, a narrow mountain road and again down to the level of the Fraser. Fortunately all has been done without loss or accident of any kind. The vessel is in anything but a safe place, but is moored by steel cables as securely as possible under the circumstances, and will be hauled into safe quarters as soon as the river rises sufficiently. With the success attained by this discription of dredger, I have no doubt others will follow next year. There is ample room for a fleet of them in the District of Lillooet. The dredger at work below Lillooet Bridge, referred to in my report of last year, was found to be a failure, and I understand the Company proposes using a different style of machine.

"The following abstract shows the mining transactions in the District of Lillooet for the year:—

"Recorded,	Mineral Claims	1,135
Conveyances of	〃	348
Abandonments,	〃	4
Certificates of work,	〃	139
Water grants for	〃	3
Recorded,	Placer Claims	6
Re-recorded,	〃	4
Water grants for	〃	7
Conveyances,	〃	9
Dredging leases in force, Placer		15
〃 applied for		4
Hydraulic mining leases in force		41
Free Miner's Certificates		$2,755 00
Mining receipts general		9,997 20"

NANAIMO DISTRICT.

TEXADA ISLAND.

For many years exploratory, and even mining, work has been carried on at irregular intervals on this island, but during the past two years interest has been greatly revived and several properties are now being actively prospected. Prospecting has been, as far as the interior of the island is concerned, confined to the northern portion, probably because to the south no discovery has yet been reported and the underbrush is much denser; hence the upper ten miles of the island has been pretty well located.

LOCATION.

The island, lying in the Straits of Georgia between Vancouver Island and the Mainland, about 90 miles north from Victoria and 40 miles from Vancouver, has a length of about 27 miles, and an extreme width of 5.5 miles. Topographically it is very rocky and mountainous, and the bold and rocky shores are such that no good harbours are afforded except some shallow bays exposed to certain winds that prevent, when blowing hard, landing from the steamer. In this northern part the timber is good but not thick, and the underbrush is comparatively light, the ground being very rocky from the very large angular boulders and the jagged, cliffy character of the rock formations.

GEOLOGY.

Dr. Dawson, in the Geological Report, 1886, page 32, reports:—

"Texada Island is composed, for the most part, of the rock of the Vancouver (Triassic) series, and chiefly of altered volcanic materials. These are, however, traversed by somewhat important granitic masses particularly on the north-east shore, while the northern extremity of the island, for the length of five miles, is largely composed of more or less crystalline limestone, which is frequently a true marble. Deposits of copper, marble and magnetite iron ore have been located on the island, and work undertaken on them, though the last mentioned mineral is the only one of which the exploration has attained any importance. * * * The association and inter-bedding of volcanic rocks with the marbles of the northern part of the island, and the intercalation of these limestone beds with those of the southern portion, indicate the close relationship in time, of the two classes of rock.

"Point Upwood, and the southern end of the island in its vicinity, is composed of hard, massive, greyish and greenish-grey rocks, many of which, though much altered, are still evident agglomerates, and show their fragmental character on weathered surfaces.

"On rounding the south-east point of the island, well-stratified greenish and *grey feldspathic hornblendic* and *schistose* rocks are met with, presenting a ribboned appearance on weathered surfaces. They are not far from vertical in attitude, and the strike, which is fairly regular, nearly coincides with the coast, causing the same rock to characterize it for several miles northward. These rocks are closely associated with *agglomerate* and *ash rocks*, which sometimes replace them on the shore, and eventually preponderate and occupy the coast to the exclusion of other materials to a point nine miles north of the south point. Thence, for three miles, the only rocks seen along the shore are *grey hornblendic granites* of coarse or medium grain. Beyond these, greenish-bluish and grey rocks, composed of altered volcanic materials, again appear, and occupy the shore to a place abreast of Scottish Fir Point. These rocks are here even more completely altered and hardened than usual, being traversed by dykes of dark greenstone and some of granite. They are extremely shattered, and jointage places, coloured by copper, were observed in several places. At north-east point of the chart, and for nearly two miles south-east from it, the shore is again occupied by granitic rocks, which, near their junction with the volcanic series, hold numerous dark fragments, as is usual at such junctions."

Nearly all mining and prospecting are practically confined to a strip across the island about three miles wide or north of a line from the Iron mine to Spratt's Bay, but there is no reason why, from geological conditions, that prospectors should not find veins in other parts of the island, as hitherto they have kept close to the trail that runs from the Iron mine to Van Anda Bay.

Within this strip the formation consists mostly of highly altered, fine-grained, dark green amygdaloidal rock of the volcanic series, but the crystalline limestone appears frequently and bears an important relation at the "Van Anda," "Raven," and "Iron" mines.

VEINS AND ORE DEPOSITS.

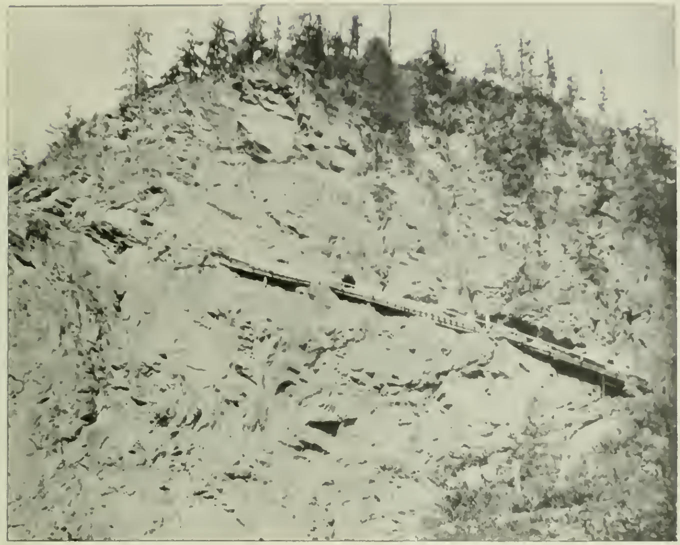
(*a.*) Bornite, or peacock copper ore, along a dyke where it cuts through the crystalline limestone at the "Van Anda" mine. Several hundred tons of this ore have been shipped:

(*b.*) Chalcopyrite, or yellow copper, in the altered volcanic material near contact with limestone, as at the "Raven" and "Little Billie."

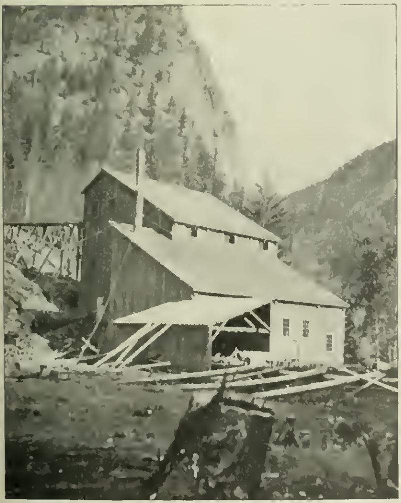
(*c.*) Magnetite, with some chalcopyrite, in granitic mass at contact with limestone, as at the "Iron" mine.

(*d.*) Quartz veins with free gold, traversing the altered amygdaloidal rock, as at the "Victoria," "Texada," "Potosa," "Lorindale," etc. These veins are small, from 2 to 20 inches wide, but near the surface on some of these have been found very fine samples of free gold, but in depth they are found to be irregular in size and to carry considerable sulphurets.

Veins follow, of course, lines of fracturing in the altered volcanic rock, and along these lines is seen the evidence of motion in the smooth walls. The quartz is not always found to be



PLATFORM ALONG VEIN IN FACE OF CLIFF.



STAMP MILL.

THREE RAIL TRAMWAY.

GOLDEN CACHE MINING Co., LILLOOET, B. C.

continuous, but in places the greyish-green altered country-rock is impregnated with sulphides, such as iron and copper pyrites, and sometimes a little galena, and also gold. Running parallel with these veins, are often seen smaller quartz stringers, also mineralized.

Conditions.

In the revival of interest that has led to the amount of prospecting done during the past two years on the island, there have been three factors, (*a*) the discovery of gold values in sulphides similar to those at Rossland; (*b*) the extraction of gold in small quantities from these small quartz veins by crushing in a small mortar, and panning rich decomposed surface material, by which one or two men have made a living for years; (*c*) the discovery of the "Van Anda" ore-shute.

Little idea can yet be formed of the prospects of mining on this island, but the considerable amount of work now in progress and to be detailed below, will greatly serve to show what values may be in these various veins and deposits. It can be said that the values now being got (not referring as to the "Van Anda") in this initial work although not high, are such as to encourage much more work, to learn whether depth will disclose better quantity and quality of ore, and, as in nearly every new district, this preliminary work must simply be awaited when surface indications give but very scanty clues.

On the "Van Anda," the small and insignificant out-crop discovered, has proved to be only a small pointer or index to a much larger ore-body below, and on some of the properties, the small surface indications may be found to cover important leads.

Roads and Trails.

From Van Anda Bay a road extends inland about a mile, thence a trail leads down to the "Raven" mine on Spratt's Bay, and another crosses the island to the road now built, two miles from the iron mine on the West Coast.

This road may be shortly continued across the island. Trails also run to the different group of claims. The highest elevation on the trail from Van Anda, across the island to the Iron Mine, is a little over 700 feet.

Transportation.

The schedule of steamboat dates is often changed, but during the past autumn one steamer a week was running from Victoria *via* Nanaimo, and from Vancouver two steamers twice a week for all points along the east coast of the Island and points on Mainland, so that supplies could be landed cheaply at any point if weather was not bad. In shipping ore, scows were loaded then towed to port at a cost of $1.50 to $2.00 per ton.

Water and Timber.

Small streams supply fresh water, but Kirk and Priest Lakes, if converted into storage reservoirs by dams easily constructed, will supply a considerable amount of water for power purposes. The timber is good and plentiful on the island, very suitable for mining work.

Titles to Land.

A considerable amount of land has been taken up as pre-emptions, upon which the locators of any mineral claims may be required to put up a bond to indemnify the owner of the pre-emption for any damage that may be done in prospecting and mining, and only the precious metals can be taken by the owner of the mineral claim. However, there are maps showing the position of these pre-emptions, and the rest of the land is open to location if not already staked off by other prospectors.

Mining Operations.

As many as possible of the working claims were examined, but several being opened up this winter could not be reached in the limited time at disposal, November 10th to 16th.

Van Anda. The Van Anda Copper and Gold Mining Company, capital stock, $5,000,000; President, Ed. Blewitt, Seattle, owns a large tract, or 840 acres of land on the north-east side of the island, and work has been done on two claims, the "Copper Queen" (Van Anda mine) and the "Little Billie."

Copper Queen or "Van Anda" mine. This ore-body, consisting of bornite (peacock copper) and some chalcopyrite, with gold and silver in a feldspathic, calcareous and garnetiferous gangue betrayed itself in one place where a little band, 6 to 14 inches wide, of this beautiful ore cropped out in the very crystalline limestone. Here a shaft was sunk vertically 32 feet until it encountered a dyke cutting across the ore, after which this shaft followed down, but in ore, along the wall of this dyke on a pitch of about 70°, to the depth of 103 feet.

Mine. It is now seen that this ore-body is intimately associated with a light-coloured body of garnet rock which traverses with a strike, north 30° west, the limestone marbleized at places of contact. At an opening on the surface at the site of the new shaft this mass is only 2 feet wide, and the ore occurs on either side in both it and the limestone, but on the 100-foot level below it is 15 feet thick, the ore shute worked out down on one side being continuous and, in places, 6 to 7 feet wide of bornite in stringers and bunches, with this rock and some of the marble as a gangue. A cross-cut here in this mass shows a little ore on the other side where the ground should be carefully prospected, as it is quite possible an ore-body may be there located.

This shaft is very crooked, but it has served its purpose for prospecting. At about 50 feet a drift was run 128 feet south-easterly, and above it a stope about 70 feet long of 2 to 5 feet of mixed ore has been worked out nearly to the surface. On the 100-foot level in the drift 135 feet to the south-east the ore-shute continued for nearly 80 feet, but nearly all ore was stoped out leaving, at the widest point, 5 to 6 feet of good, but mixed ore in the bottom where the new shaft will be sunk after an opening is made to the surface. To the north-west this drift cuts through the large porphyry dyke mentioned above, and that out-crops about 65 feet north-west of the shaft, and also a second but smaller one, but although 175 feet of work has been done here, the continuation of this ore-body north-west of this big dyke has not yet been found.

Hence there has been so far developed an ore shute 80 to 100 feet long and 1 to 7 feet thick of this mixed auriferous bornite ore, nearly all of which above the drifts now run has been mined out and sorted into three classes, of which the first class has been shipped. A proper working shaft will soon be down to the 100-foot level, after which sinking will be continued if sufficient capital is secured to provide a good plant and to permit more extensive and proper development.

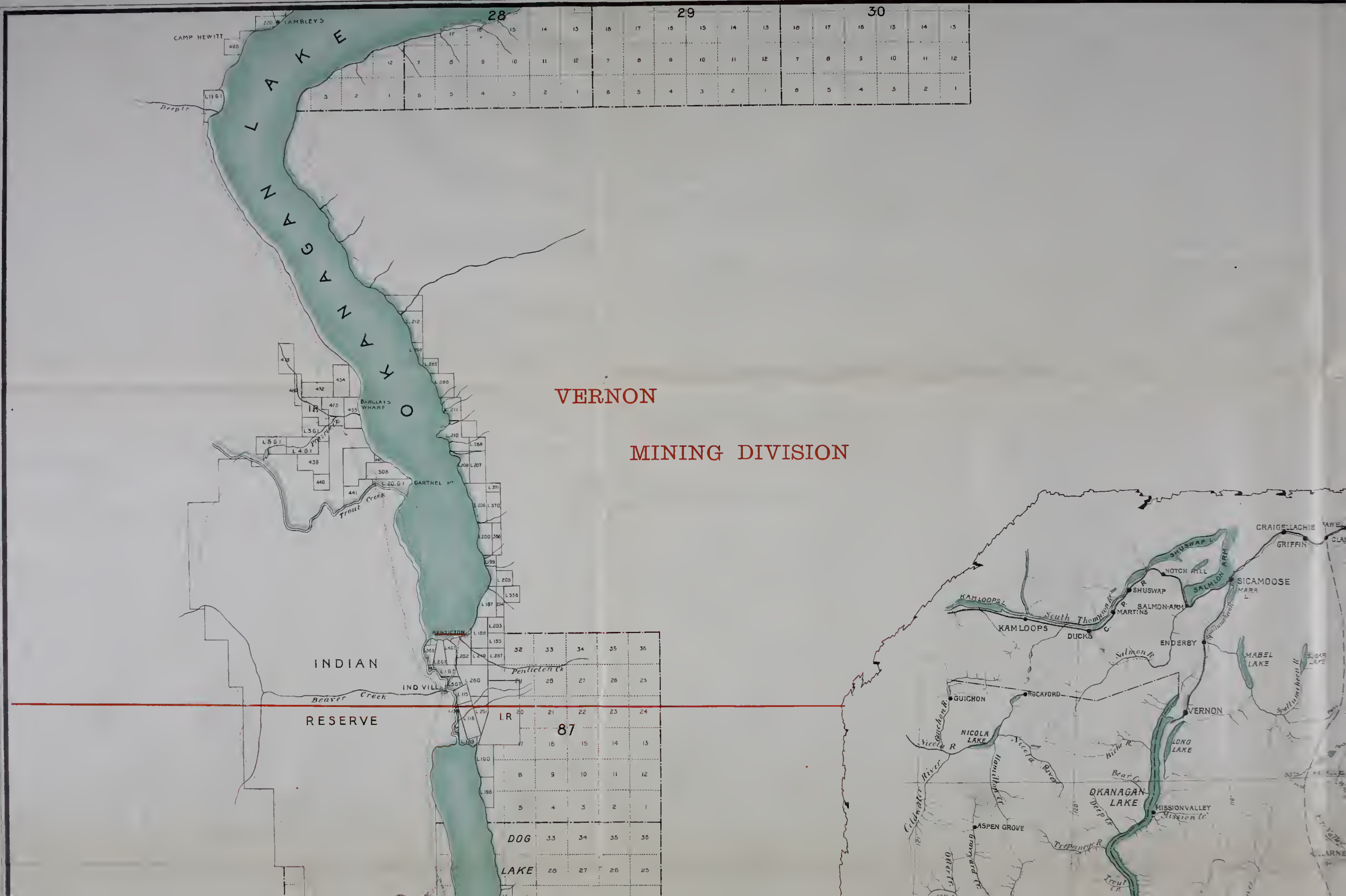
Ore. About 300 tons have been sold, which averaged .34 ounces in gold, 6 ounces in silver, and 6.2 per cent. of copper. The gold contents, according to the degree of hand-sorting, run from $2 to $18 per ton, the silver from 3 to 10.5 ounces, and the copper from 3 to 18.5 per cent. Hence, while the second-class ore runs from $9 to $ per ton, the first-class or sorted runs from $33 to $42. On account of its very calcareous gangue, very low smelting charges have been secured from Mr. Pellew-Harvey, agent for Vivians & Sons, Swansea, and as it is sent from Vancouver in ballast, shipping charges amount to only $2 per ton, or the cost of transfer in waggon three-fourths of a mile from the mine to Van Anda Bay, where it is loaded on a scow and then sent to the above port, sampled, and then sent on board the sailing vessels for England.

Plant now consists of a small engine, hoist, and pump, but at the new shaft it is proposed to install a better plant of boiler, hoist, pumps, and air compressor.

Water.—In the mine, 45 gallons per minute are now handled, but a stronger pump will be necessary, especially in the rainy season, when the creviced limestone lets in much surface water.

Labour.—Most of the work has been done by Chinamen at $1.25 per day, but in November both whites and Chinamen were engaged, the latter of whom have to be taught from the very beginning, but never learn to strike with either hand. At the landing, near the little Van Anda Bay, and at the mouth of the creek, from Priests Lake, are built boarding and bunk houses, store, etc.

Little Billie.—About 1,500 feet north of the Van Anda mine, and 100 yards from the beach, work was done many years ago on a very irregular deposit of chalcopyrites and iron pyrites, but no bornite, that is found in the crystalline limestone at its contact with eruptive granite. On a tunnel and shaft $18,000 were then spent and the present company has done some work in this tunnel and on the surface, and in 1896, 30 tons of ore were gathered up and shipped to Everett, yielding, it is stated by Mr. R. Blewitt, 18 ozs. silver, $4 to $5 in gold, and 12 % copper.


VERNON
MINING DIVISION
LAKE OKANAGAN
CAMP HEWITT
LAMBLEYS
Deep Cr
BARCLAYS WHARF
IR
Prairie Ck
GARTHEL PT
Trout Creek
PENTICTON
Penticton Ck
INDIAN
RESERVE
Beaver Creek
IND VILL
I.R
87
DOG
LAKE
28
29
30
KAMLOOPS L.
KAMLOOPS
South Thompson R.
C. P. R
DUCKS
MARTINS
SHUSWAP
NOTCH HILL
SHUSWAP L.
SALMON ARM
SALMON-ARM
SICAMOOSE
MARA L.
CRAIGELLACHIE
GRIFFIN
ENDERBY
Salmon R.
Spallumcheen R.
MABEL LAKE
SUGAR LAKE
GUICHON
Guichon R.
ROCKFORD
VERNON
NICOLA LAKE
Nicola R
Nicola River
Coldwater River
Hamilton Cr.
Bische R.
LONG LAKE
Bear C.
OKANAGAN LAKE
Deep Cr.
MISSIONVALLEY
Mission Cr.
ASPEN GROVE
Trepanege R.
Otter Cr.
Graveyard Cr.
Trout Cr.
120°
121°
119°

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Physical &
Applied Sci.
Serials

British Columbia, Dept. of Mines and
Petroleum Resources
Report

MAP
OF PORTION OF
OSOYOOS DISTRICT
BRITISH COLUMBIA

Compiled by Direction of

THE HONOURABLE G. B. MARTIN
CHIEF COMMISSIONER OF LANDS & WORKS

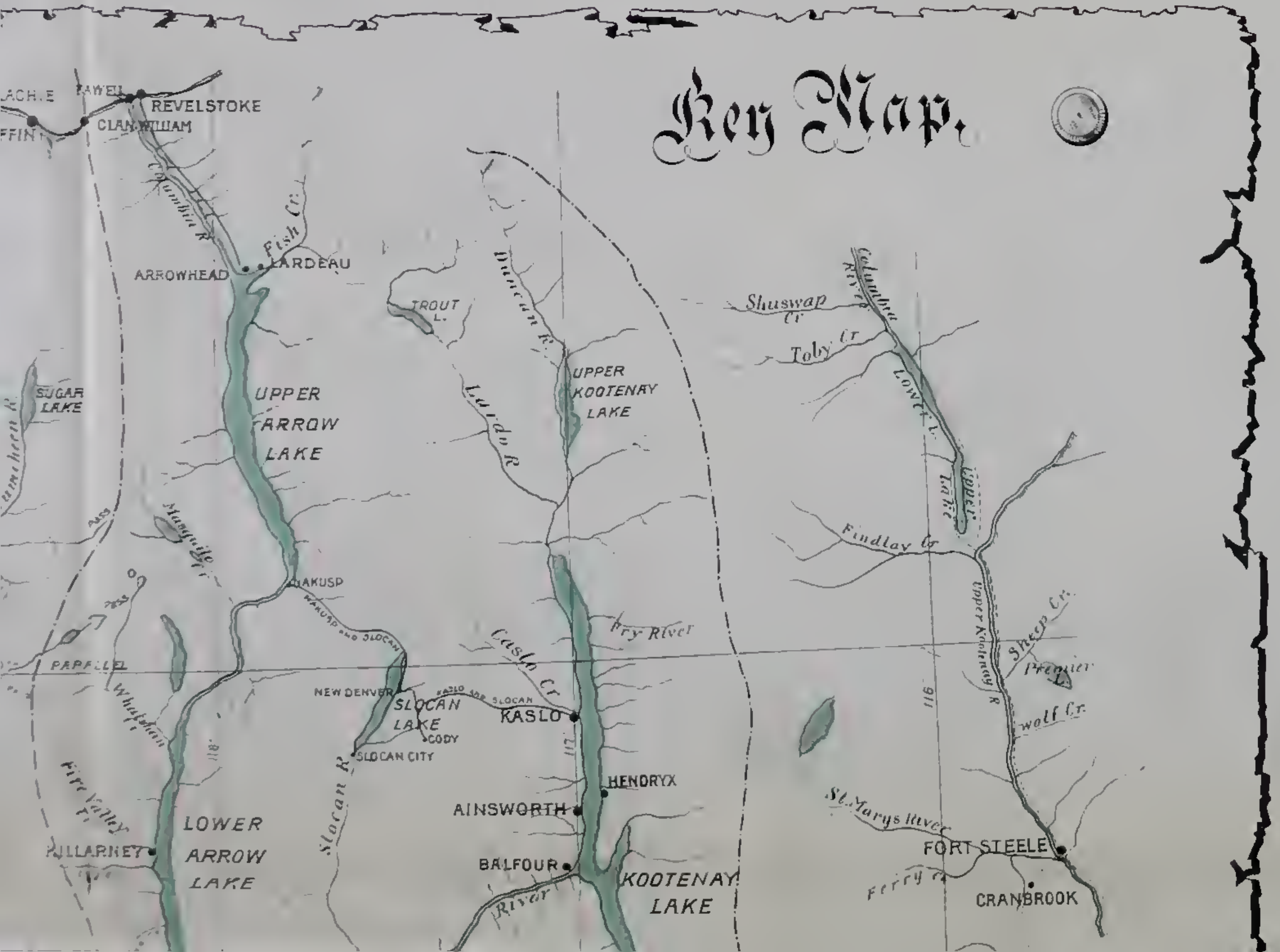
VICTORIA 1897.

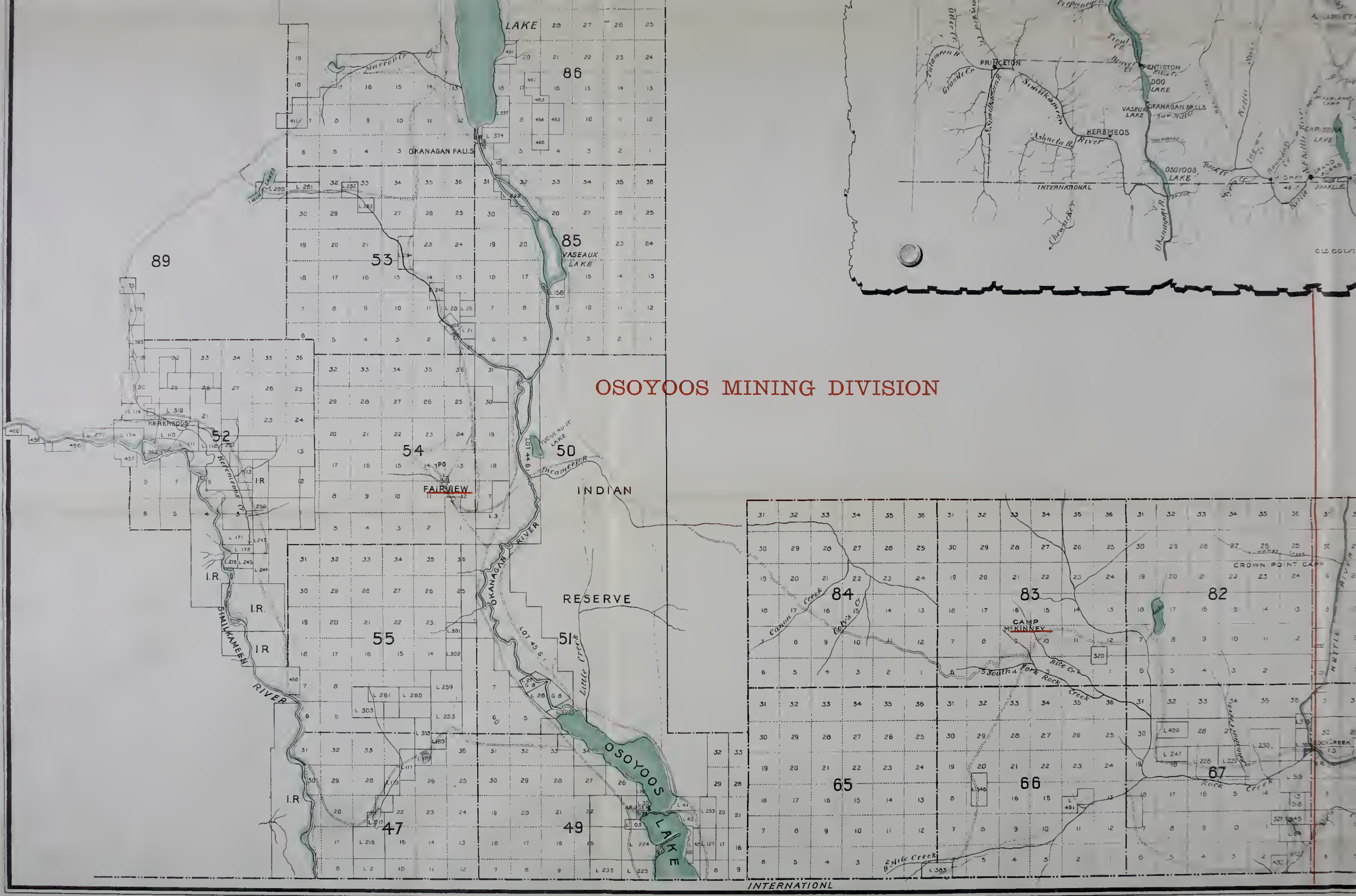
SCALE.

Drawn in the Office of Lands & Works, Victoria, B.C. January 1897

Tom Kains
SURVEYOR GENERAL

COLONIST LITHO VICTORIA.




OSOYOOS MINING DIVISION
LAKE
OKANAGAN FALLS
86
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VASEAUX LAKE
89
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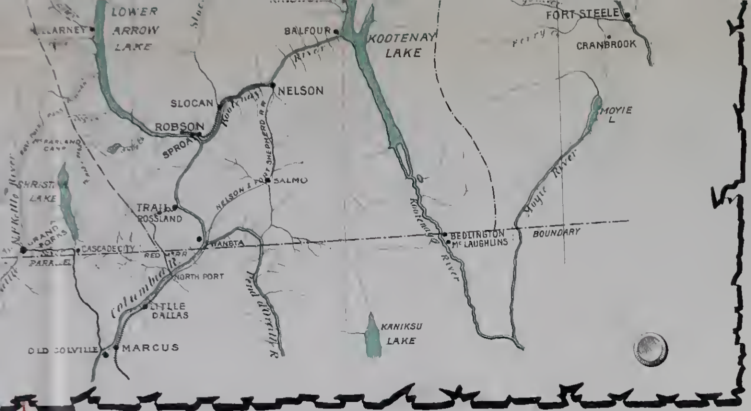
Marron Cr
TWIN LAKES
52
KEREMEOS
54
FAIRVIEW
PO
50
TUC-UL-NU-IT LAKE
Tucameen R.
LOT 44 G1
INDIAN
RESERVE
51
LOT 45 G1
Little Creek
OKANAGAN RIVER
55
Keremeos Cr
I.R.
SIMILKAMEEN RIVER
47
49
OSOYOOS LAKE
KRUGER
INTERNATIONL
84
Canon Creek
Coyote Cr
83
CAMP McKINNEY
Rice Cr
South Fork Rock Creek
82
CROWN POINT CAMP
KETTLE RIVER
65
66
67
Rock Creek
2 Mile Creek
ROCK CREEK PO
PRINCETON
Tulameen R.
Otter Cr
Granite Cr
Similkameen R.
Ashnola R.
KEREMEOS
Trout Cr
PENTICTON
DOG LAKE
VASEUX LAKE
OKANAGAN FALLS
OSOYOOS LAKE
Okanagan R.
Chewuckan
INTERNATIONAL
Kettle River
Rock Cr
CARP LAKE
GRAND FORKS
GREENWOOD
OLD COLV


LOWER ARROW LAKE
KILLARNEY
BALFOUR
KOOTENAY LAKE
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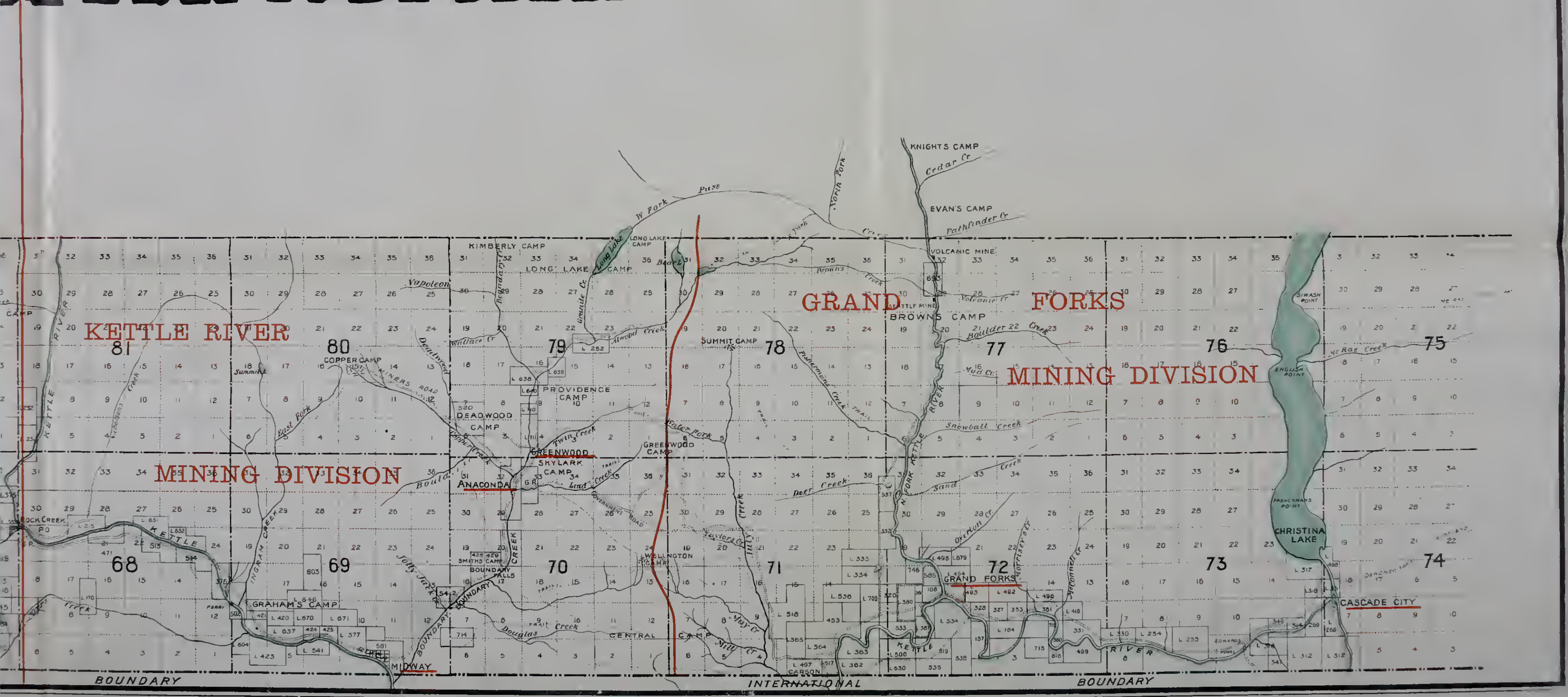
FORT STEELE
CRANBROOK
NELSON
SLOCAN
ROBSON
SPROAT
MOYIE L
Moyie River
SALMO
NELSON & FORT SHEPPARD R.R.
TRAIL
ROSSLAND
CHRISTINA LAKE
GRAND FORKS
CASCADE CITY
WANETA
RED MTN R.R.
BEDLINGTON
McLAUGHLINS
BOUNDARY
NORTH PORT
Columbia R
LITTLE DALLAS
Pend d'Oreille R
OLD COLVILLE
MARCUS
KANIKSU LAKE


KETTLE RIVER MINING DIVISION
GRAND FORKS MINING DIVISION
KNIGHTS CAMP
Cedar Cr
EVAN'S CAMP
Pathfinder Cr
VOLCANIC MINE
BROWNS CAMP
Volcanic Cr
Boulder Creek
Mud Cr
Snowball Creek
KIMBERLY CAMP
LONG LAKE CAMP
Long Lake
Baker L
W Fork
Pass
North Fork
Browns Creek
Napoleon
Wallace Cr
Deadwood
Granite Cr
Atwood Creek
COPPER CAMP
MINERS ROAD
Summit
East Fork
PROVIDENCE CAMP
DEADWOOD CAMP
Twin Creek
GREENWOOD
SKYLARK CAMP
ANACONDA
Lind Creek
GOVERNMENT ROAD
GREENWOOD CAMP
SUMMIT CAMP
Fisherman Creek
Deer Creek
Sand Creek
WELLINGTON CAMP
July Creek
May Cr
CENTRAL CAMP
CARSON
GRAND FORKS
Overton Cr
Morrissey Cr
McConnell Cr
McRae Creek
SIWASH POINT
ENGLISH POINT
FRENCHMANS POINT
CHRISTINA LAKE
CASCADE CITY
DEWDNEY TRAIL
ROCK CREEK PO
KETTLE RIVER
INGRAM CREEK
GRAHAM'S CAMP
Jolly Jack Cr
BOUNDARY CREEK
SMITHS CAMP
BOUNDARY FALLS
Douglas Creek
MIDWAY
81
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BOUNDARY
INTERNATIONAL
BOUNDARY

At the mouth of the tunnel the ore is about 18 inches thick, but in the tunnel and down the shaft the ore was always found mostly in stringers and bunches in the limestone, associated with the garnetiferous rock seen at the Van Anda, also garnet and tremolite. No work was done here during the past year.

Raven.

The *Raven*, *Chief* and *Joan*, 400 yards by waggon road from Spratt's Bay, and three miles south, by trail from the "Van Anda," are owned by Messrs. Ed. and Wm. Blewitt, C. J. Spratt, Jno. Wilson, *et al.*

On the "Raven," where on the surface, along the strike for 30 or 40 feet, more or less copper pyrites were to be seen, in one part 3 feet wide, a 6 by 9-ft. shaft had been sunk 98 feet, but apparently along the edge of the ore-shute for very little ore was found, but at 40 feet a drift was being started to run under the ore showing on top to the south, and at the time of visit (November 11th) there were five feet of mixed ore or chalcopyrite mixed through the greenish altered eruptive rock lying next to the crystalline limestone, which here formed the hanging wall in the shaft, but did not show here on the surface. The ore was being sorted, and 3 or 4 tons containing a good percentage of copper pyrites were on the dump, in which the gold or silver values are said to be low. Along the strike of this deposit, or S. 15° E., some stripping showed iron-stained rock and some mineralization, and it was claimed that this zone could be traced through a number of claims, but no work to demonstrate it was seen. Several hundred feet to the north, an 80-foot tunnel has been driven in along the limestone, but nothing was discovered.

Eight men were at work, and an 18-h.p. hoisting engine with vertical boiler, good gallows-frame, etc., were at the shaft.

Simpson.—South of the "Raven," 23-foot shaft showing some copper pyrites.

Sandfly, *Comet* and *Butterfly* have been located along the course of this supposed ledge, but little work, other than assessment work, has been done.

Mr. Johnson is developing a property 3 or 4 miles south of the "Raven," where he has discovered yellow copper ore, and on the "Cap-Sheaf" a shaft was being sunk on the same kind of ore, but lack of time forbade a visit to these claims.

KIRK LAKE GOLD MINES CO.

This company owns the *Victoria*, *Texada*, *Lindsay*, *Climax*, *Last Link*, Crown-granted, and the *Roy* and *Mill Site* mine locations, also 60 acres for millsite. Capital stock, $600,000, in $1 shares. President, D. R. Dingwell, Winnipeg; managing director, W. L. Challoner, Victoria.

On these claims are a number of small quartz veins in the dark green porphyritic rock, in the decomposed outcrops of some of which very fine specimens of free gold have been found. In depth, in the limited amount of work done, these veins are found to be irregular in width and to contain more or less sulphides and some gold in a gangue of quartz and country-rock, here altered to a fine-grained, greenish-grey mass along the fracture plane. On acquiring more funds, these claims will be further prospected and a small but efficient plant for hoisting and pumping will be put on the "Victoria." This property surrounds Kirk Lake (45 acres in extent), about the centre of the island, and is well timbered, and while trails radiate to different points, the road from the west coast will be continued from the "Lorindale" to this group.

Victoria has an inclined shaft, 102 feet deep (full of water), down on a quartz vein, 8 to 12 inches for most of this distance, strike east and west, and a cross-cut at the bottom, 26 feet to the south, towards a second vein 60 feet away. At the top of the shaft the rock taken out is seen to be this eruptive rock just described, more or less mineralized with iron pyrites and with quartz stringers, but very little quartz ore is on the dump. Along the surface this vein shows a decomposed, iron-stained rock, with free gold; but the unaltered material below is said not to assay high at all. The other vein, 4 to 20 inches wide, of white quartz, with a little iron and copper pyrites and traces of galena, can be traced for several hundred feet on the same east and west strike, but only a few shallow holes have been sunk.

Texada. In a small 10-foot hole, along a smooth wall, strike, S. 60° W., dip, S. 30°, E. 60°, is a brecciated mass, 6 to 10 inches wide, of quartz and the eruptive country-rock, with iron pyrites and sometimes specks of free gold—not traced for any distance, only seen on top of a small knoll.

Lindsay. On a knoll of porphyritic rock is another small vein, 4 to 10 inches wide, of brecciated quartz and greenstone, with copper and iron pyrites and traces of galena, strike, S. 60° W., traceable for a short distance, has a 10-foot hole. About 400 feet away is exposed another small vein of same character, running east and west.

Water power can be secured to a certain amount for part of the year by easily constructing a 15-foot dam at the outlet of Kirk Lake, where water carried in 3,000 feet of piping to the millsite will have a fall of 110 feet Considerable work will have to be done before the value of these small veins can be determined or understood.

TIGER-LION.

On these two claims, south of the above group,, at a 35-foot shaft, full of water, a little ore or mixed quartz and greenstone, with copper pyrites, was seen on the dump.

NUT CRACKER-WARRIOR.

On these two claims, south-east of the Kirk Lake property, owned by Stanton and Evans, Nanaimo, there can be traced for 100 feet an east and west vein of the same brecciated mass of quartz and greenstone, 4 to 14 inches wide, carrying some sulphides and, it is said, free gold. A shaft, 18 feet deep, near the main trail.

LORINDALE.

On this claim, owned by a Victoria syndicate, Chas. Hayward, Secretary, some magnificent samples of free gold on the surface of a small quartz vein. These veins have been located, and on No. 1, a few inches wide, near N.E. corner-post, very little has been done. On No. 2 a tunnel (closed) was driven 70 feet along the vein, after which a shaft was sunk 46 feet at the mouth of this tunnel, where an assay of 60 ounces in silver had been got, and at the bottom it is said that there were 26 inches of bluish quartz, with copper and iron pyrites but low gold assays. The fine specimens were got from No. 3 vein, 60 feet south of No. 2, a vein 2 to 16 inches wide, of bluish quartz and fine-grained iron pyrites, traceable for over 400 feet. Many years ago a cut was run in on this vein and gold washed out of the decomposed material, but the present owners have only sunk a small 19-foot hole, where the vein is 6 to 16 inches wide of quartz and sulphides. No work was done during the past year. Log cabin and blacksmith shop. Timber good and plentiful. Very little water.

SILVER TIP.

The *Silver Tip*, *Alpha* and *Nancy Belle*, Crown grants applied for, lying about half a mile from Davis Bay, and over 700 feet above salt water, are bonded by the Texada Proprietary Co., Secretary, J. C. Keith, Vancouver. On the "Silver Tip" a shaft (full of water) had been sunk 141 feet, by using a horse-whim, and on the dump was seen some of the ore taken out, or the light coloured green stone, with a little quartz and galena, and iron and copper pyrites. At a lower point a new working shaft, 6 by 9 in the clear, was just begun, where the vein of quartz showed a few inches wide, but in the prospect shaft it is said there were 4 to 5 feet of this mineralized material. Mr. J. Findlay was in charge with 12 men, and machinery consisting of steam hoist, and a Knowles pump had been ordered. A road one and one-half miles long may be built to Davis Bay. Good cabins, good timber.

SURPRISE.

If more claims could be developed with the same economy and earnestness shown here by the party of eight Comox men, progress in mining affairs in British Columbia would advance much more satisfactorily. Here, these men banding together their interests and means and all working, are proving up their property after the manner that has made some of the Western Mining States famous, or by the simple method of talking little and doing much.

The *Surprise*, *Dude*, *Dundee* and *Comox Fractions*, owned by A. Jell *et al*, Van Anda P. O., lie south-east of the "Silver Tip," and on the Surprise, a shaft equipped with a horse-whim has been sunk 258 feet, along the line of fracturing that runs S. E. by N. W., and dips S. W. at an angle of 61 to 71 degrees, in fine-grained greenish feldspathic rock. Along this fissure the country-rock is shattered and more or less impregnated with quartz, copper and iron pyrites, and sometimes galena and blende. In places for several feet it is barren, then will succeed a mineralized body, from which assays from \$4 to \$34 in gold, silver and copper have been obtained, one such body 18 inches wide, carrying, Mr. Jell states, \$20 in value. At the 64 and 200-foot levels, short drifts run along the wall, showing some mineral, and at 250 feet a drift was in 12 feet. This property is still a prospect, but encouraged by the fair assays obtained, work is being steadily advanced to see if ore-bodies of size can be found. The amount of copper is small, and as this will be smelting ore, the values must come mostly from the gold and silver contents.

A road two miles long runs to the coast at the Iron mine. Very little water makes in the shaft, easily handled by bucket. Cabins, etc., erected.

VICTORIA-TEXADA GOLD MINING COMPANY, LIMITED.

This company, capital stock $1,500,000; Secretary, Beaumont Boggs, Victoria. On the west coast of the island, and on the Francis (?) claim, three veins were found in the compact, dark green amygdaloidal rock, at water level, on two of which the following work has been done.

Vein No. 1 running north 80° east, dip vertical, has a tunnel 40 feet long. This vein is scantily defined in the face of the precipitous sea-wall, but at very low tide when the vein was washed, some fine samples of free gold were found. In this tunnel this vein is distinctly seen in the floor (washed clean by the high tides) to follow a line of fracture and shattering and to consist of bluish-white quartz with brecciated fragments of country-rock. The vein for most of its length is from 2 to 6 or 8 inches wide, with some copper and iron pyrites (but no free gold was seen), but in the face of the tunnel the width suddenly increases to 22 inches. A lot of this ore from near the surface was treated at the Victoria Metallurgical Works, and gave very good results in gold.

On *Vein No. 2* a short distance south of No. 2, a tunnel has been run in from a point 25 feet above high water, about 165 feet. At the beginning the vein is 8 to 12 inches wide of quartz with sulphides, and continues with a width of 2 to 4 inches for some distance along a smooth hanging wall, but beyond this is seen no more vein.

Vein No. 3 of apparently nearly solid pyrites, about 2 feet wide, occurs in a small cove in the steep cliff-side, but no work has been done here. All work was suspended in November. Timber plentiful a short distance back from shore, but no water except the sea water.

GOLDEN SLIPPER.

This claim, the first Crown-granted on the Island, has yielded its owner, Mr. Miller, considerable gold where he has crushed and panned the decomposed surface material. Some work has been done on this lead itself, but it could not be examined as a hole at the entrance was full of water. A tunnel to tap the vein a little lower down was being run in by the owner.

OTHER CLAIMS.

On many other claims more or less work has been done where the conditions are much the same as described in the above claims, but they were not visited. Any such may be named the *Keystone*, *Mountain Chief*, *Tyhee* and *Whistler*, *Wanderer*, *X-Rays*, *Hidden Treasure*, *Genevieve*, *Daisy* and *Golden King*, *Palmerston*, *California*, *Olympia* and *Sheba*, *Minerva* and *Green*, *Cameron*, *Yellow Jacket*, *Monarch of the Glen*, *Nest Egg*, *Volunteer*, *Iron Duke*, etc.

IRON MINE (COPPER).

The Puget Sound Iron Co., have for many years held a large tract of land on this Island on which are the large deposits of magnetite found near the line of contact of the granitic and stratified rocks and limestone. A considerable amount of work has been done here, but no ore has been shipped for years, or nothing done since 1890, until recently the company determined to prospect where copper was showing in this ore. The superintendent, H. W. Lee, had sunk a shaft 56 feet and had a cross-cut in 14 feet, but while there were 4 to 5 tons of nearly solid copper pyrites on the dump, still the ore was being found in irregular bunches and stringers in the magnetite. No information was got of gold or silver contents, if any are present, and the water becoming too much to handle with windlass-bucket, work has been suspended. Should a deposit of pay ore be found here, a tunnel can be run in from near the shore and give a depth of 300 feet, and ore can be shipped from here when the wind is favourable.

REPORT BY MARSHALL BRAY, GOLD COMMISSIONER, NANAIMO, B. C.

"The information on mining operations for the past year is rather meagre, as, outside of Texada Island, very little actual development has been done, the large majority of the mineral claim owners having only done the necessary work to entitle them to hold their claims. The Yukon excitement acted as a set-back to prospecting and development last summer, and by present indications the excitement for those northern gold fields will retard development of the coast mineral claims during the coming season.

"This Mining Division was enlarged last summer by taking a slice from the New Westminster Mining Division, and another slice from the Victoria Mining Division in Coast District, and 132 records were transferred from the former, and 374 records from the latter, to this mining division.

"For the second year this mineral division has made a fair showing, as follows:—

Free Miner's Certificates issued	710
Mineral claims recorded	1,157
Certificates of work recorded	287
Paid $100 each in lieu of work recorded	19
Certificates of improvement recorded	14
Bills of sale of mineral claims recorded	272
Grants of water-rights recorded	3

Which gave a total revenue collected from the above for the year ending 31st of December, 1897, of $10,025.25.

"367 records of mineral claims lapsed during the year of 1897, the work not having been recorded, and I still have 2,088 records in good standing on the 31st December, 1897. All these claims are along the coast line, or within easy reach of the coast, with the exception of those in Dunsmuir District, into which a waggon road was built last fall.

"The facility with which these mines can be operated and worked along the coast, owing to the cheapness of freight and supplies, the nearness of same to coal, coke, wood, flux, and in many places good water-power, will make them, when developed, good paying investments, and capitalists are just beginning to awaken to the possibilities of our coast mines, and quite a number of mineral claims have been purchased or bonded by them, and no doubt they will push development work on their holdings this coming season.

"The only mine that has shipped any ore of any amount from this district in 1897, is the "Van Anda" mine on Texada Island. They shipped 131 tons of rock to Swansea, and the same netted them $1,625, on which they paid the mineral tax, this being the only mineral tax paid for 1897."

VANCOUVER ISLAND.

During the past year a large amount of prospecting has been in progress at different points on the Island, more especially on the West Coast. Here the mountains contiguous to Barclay and Clayoquot Sounds and Sidney Inlet have been attracting much attention by the discovery of copper-bearing ore, upon some of which deposits considerable work is now in progress. A number of properties were sold in the proximity of Uchucklesit Harbour and Anderson Lake, where a company is beginning extensive explorations.

On the Sarita claims, little or no work has been done during the past year. On China Creek, work has ceased on the "Duke of York" placer claims, but prospecting is being done on the "Cataract" leases. Considerable work was done on the "Alberni Consolidated" quartz leads, and these claims have recently passed under the control of an English company. During the year, several lots of ore, aggregating 30 tons, were shipped out to be tested that yielded values of $18.60 to $39 in gold per ton. or an average of 1.57 ounces per ton. It is now very likely that vigorous work will soon be begun. The "Golden Eagle" is also being developed under the management of Mr. McQuillan.

The copper properties on the West Coast will now be, in many cases, carefully explored. Near Goldstream, locations have recently been made on deposits of copper ore, from which is got massive chalcopyrite, carrying low values in gold and silver. In November, a short visit was made to Mount Sicker.

Mount Sicker.

This mountain lies south of the Chemainus River, and is reached by road and trail about six miles long from Westholme Station on the E. and N. R., the trail crossing the summit at an elevation of 2,100 feet, and then dropping down to 1,650 feet, the elevation of the chief camp. A new line for a waggon road, with a steady grade has been cut so that it is now reported that this road running from near Somenos will make the distance 4 or 5 miles from the railroad up to the mines.

The mountain is well timbered, but the underbrush is not heavy so that the prospector has comparatively easy access to the many rock exposures. On this mountain the rock formation consists mostly of the greenish eruptives found on this Island, part of which here, without a decisive investigation, has evidently been altered into a very schistose, greyish rock. There appear to be small areas or inliers of very highly metamorphosed sedimentary rocks as well, but it is in these schists that the ore-bodies are found. A description of the following claims will give some idea of the conditions prevailing here, which certainly are very favourable.

Lenora.

On this claim, on the west slope of Mount Sicker, the owners, H. Smith, H. Buzzard, *et al.*, have uncovered a large body of copper-bearing material, or a heavily mineralized zone, in one place 30 to 40 feet wide, with the typical "iron-copping," where there is an open cut, 5 feet wide, in a hard, fine-grained greenish rock heavily impregnated with fine-grained copper and iron pyrites. Here considerable solid sulphide ore is seen in this large exposure of gossany material, which has been traced farther up the hill to the "Tyee" claim, by shallow cuts and down the mountain about 100 feet to where a cross-cut tunnel has been run in 75 feet to intersect this ledge in its strike. This tunnel runs through a very quartzose schist, and crosses several small quartz veins carrying copper and iron pyrites, and near the face was a 30-inch vein of milky-white quartz with these pyrites, but the main ledge had not then been reached, although it is reported that, on since continuing it, a mass of copper-bearing material has been reached.

More extensive work will soon be begun on this property to develop this large showing of copper rock, which so far has proved to carry low values in gold and silver.

To the west, on the "Shakespeare," in a 10-foot tunnel, is a narrow vein of quartz and copper pyrites in the schists, and on the "Key City" is a small quartz vein, not traceable for any distance.

Tyee.

This claim, lying immediately above and east of these out-croppings on the "Lenora," had had the ledge traced up to its boundary line, near which an 8 by 8-foot shaft was being sunk. This has since been sunk through 50 feet of barren, greyish rock, quite free of any signs of mineralization, but at this depth as an 18-foot cross-cut revealed nothing, it was decided to sink deeper, and in a few feet, it is now reported, a body of nearly solid chalcopyrite was struck, on a ledge 10 feet wide of the fine grained "yellow copper" ore with some quartz, and already a considerable amount of this ore has accumulated on the dump.

This claim is owned by Clemont Livingstone, *et al.*, Duncans.

Belle.

On this claim lying north of the "Lenora" in the greyish schists, probably diabasic, is (*a*) a small vein, a few inches wide, of quartz and copper pyrites; (*b*) two very large quartz reefs about 100 feet apart in a solid dioritic rock, reefs 20 to 40 feet wide, of barren-looking milky-white quartz with no signs of any sulphides, and which have never been prospected or tested for gold; (*c*) another but small quartz ledge somewhat decomposed and iron-stained on which a little work has been done with no results or values in gold obtained. Located about 1,100 feet above the Chemainus River.

Copper Canyon.

On the "Victoria" and "Susan," owned by P. J. Pearson, Chemainus, a tunnel had been started on the west bank of the Chemainus River, and 100 feet above it, and run south 35° west along a small quartz vein, 4 to 20 inches wide, of quartz and copper pyrites carrying some gold and silver. This vein lies almost conformably with the inclosing schists and, besides the vein exposed in the tunnel, a little work had disclosed some mineralized rock in two other places along the east bank.

There is a fine body of water in the Chemainus here, hence an excellent water-power, but no good trails have been cut out to reach this property that lies 1,100 feet below and west of the "Lenora."

Other Claims. A large number of claims have been staked off, some in small outcrops mineralized with a little copper and iron pyrites; others in those large leads of barren-looking untested quartz, but little or no work has been done upon them. The surface indications on those claims higher up the hill, as described, are certainly very good, and these claims should be carefully prospected, but until they are, it will be futile to even consider the shipment of ore for some time to come, or until a good amount is in sight. It will not be at all difficult to find the average values in this ore by careful sorting, sampling and assaying, and if work shows up good bodies of pay ore here, the means of transport can be provided.

This section lies within the boundaries of the E. & N. R. land grant, and titles to these claims, with rights to all metals found upon them, can be obtained on purchase.

GOLDSTREAM.

During the past autumn attention has been drawn to Mount Skirt, near Goldstream, eleven miles from Victoria, where work has been in progress on the claims of the Ralph Mining Company, Registered. On five claims, the "Ralph," "Lubbe," "Phair," "Tolmie" and "Mt. Skirt," about a mile from the station on the E. & N. R., work has been done on the "Ralph" where, in a very highly altered rock, probably eruptive, have been found out-crops impregnated with some chalcopyrites. In one open cut were seen 7 to 8 feet of mixed, but low grade material also showing in some other small openings, but in a shaft 25 feet deep a shute of solid "yellow copper" ore, from 6 inches to 3 feet thick, had been followed down for about 15 feet, ore that assayed from 18 to 25% copper, 1 dwt. of gold, and 5 to 8 ounces of silver per ton. A cross-cut had been run in from the bottom of the shaft for about 15 feet, only exposing a little metallic copper along the faces in the slate-like rock. Considerable work will be done here, but it is yet too early to determine what these surface showings may lead to in depth.

VICTORIA DISTRICT.

VICTORIA DIVISION—W. S. GORE, GOLD COMMISSIONER.

"Notwithstanding the transfer, in the early part of the year, of one of the principal mining localities, viz.: Phillips Arm and vicinity, from this to the Nanaimo Division, the records issued at this office still show an increase of over double the number of the previous year.

"The revenue derived from this source shows an increase of nearly $10,000:—

	1896.	1897.
No. of Free Miners Certificates issued	690	1,204
〃 Mineral claims recorded	342	772
〃 Placer 〃	25	15
〃 Certificates of work	60	67
〃 Certificates of Improvement	1	6
〃 Grants of Water Right	13	11
〃 Lay overs	11	6
〃 Placer leases	22	34
〃 Conveyances	83	130
〃 Mill site leases		1

REVENUE DERIVED.

	1896.	1897.
From Free Miners Licences	$3,460	$11,402
〃 Mining receipts, general	3,117 10	4,359 60
	$6,577 10	$15,761 60

"Considerable interest is being taken in the development of the claims on Mount Sicker and those on the San Juan and Gordon Rivers, at which places the work during the past season has proved very satisfactory to the owners.

"I append to this report a complete list of the Gold Commissioners and Mining Recorders for the Province corrected to date; also a list of mineral claims Crown-granted during 1897."

CROWN GRANTS ISSUED FOR MINERAL CLAIMS DURING 1897.

Alberni.

Name of Claim.	District.	Name of Grantee.	Acres.	Description.	Date of Grant.
Ace of Spades	Alberni	Elizabeth J. Saunders	48 86	Section 215.	Feb'y 1st, 1897
Alberni	"	Alberni Con. G. M. Co., Ltd.	48.21	" 206.	" 17th.
Champion	"	G. Brown and G. A. Kirk	51 65	" 217	" 2nd, "
Chicago	"	Con. Alberni G. M. Co., Ltd.	51 65	" 207.	" 17th, "
Last Dollar	"	Elizabeth J. Saunders	29.76	" 216.	" 1st, "
Minnie	"	"		" 43	" 1st, "
Missing Link	"	G. Brown and G. A. Kirk		" 214	" 2nd, "
Star of the West	"	G. Brown, F. P. Saunders, M. A. Ward & F. H. Stirling	49 55	" 40	Mar. 19th, "
Victoria	"	Con. Alberni G. M. Co., Ltd.	48 21	" 205	Feb. 17th, "
Warspite	"	"	51.65	" 208.	" 17th, "

East Kootenay.

Allover	Fort Steele	C. D. Porter	32.75	Lot 1384, G. 1	July 22nd, 1897
Dean	"	"	47.9	" 1382 "	" 22nd, "
Hidden Treasure	Golden	T. Jones and W. McNeish	39.30	" 1108 "	Jan. 30th, "
Loretta	Fort Steele	J. Cronin and J. A. Finch	11.60	" 667 "	Mar. 16th, "
Moyie	"	F. Houghton and E. P. Davis	50 12	" 669 "	Feb. 9th, "
Peter	"	J. Cronin and J. A. Finch	51 65	" 665 "	Mar. 10th, "
Queen of the Hills	"	F. Houghton and E. P. Davis	50.18	" 668 "	Feb. 9th, "
Rose Fraction	"	J. Cronin and J. A. Finch	2.10	" 1380 "	Mar. 11th, "
St. Eugene	"	" "	51 30	" 666 "	" 10th, "

West Kootenay.

Argentine	Trail Creek	W. A. Ritchie	29.00	Lot 1507, G. 1	Mar. 22nd, 1897
Abe Lincoln No. 1	"	Abe Lincoln G. M. Co.	18 17	" 1296 "	April 6th, "
Alta	Slocan	W. Braden	47 69	" 853 "	" 8th, "
Alpha	Trout Lake	Lillooet, Fraser R. & Cariboo Gold Fields, Ltd	31 16	" 1553 "	May 10th, "
Argenta	Slocan	F. A. Henneberg & W. C. Price	51 65	" 1412 "	June 8th, "
Anaconda	Trail Creek	G. Pellens *et al*	8 79	" 934 "	July 21st, "
Alf	"	Alfe G. M. Co., Ld	34.65	" 1506 "	Aug. 5th, "
American Boy	Slocan	Eva Boss *et al*	8.18	" 571 "	July 30th, "
Adela	"	W. Thomlinson *et al*	48 75	" 1535 "	Oct. 6th, "
Antoine	"	Alex. Green and Smith	14 12	" 516 "	Nov. 16th, "
Annie E	Trail Creek	British Lion Mining Co.	11 49	" 1457 "	" 16th, "
Annie	Illecillewaet	Lillooet, Fraser R. & Cariboo Gold Fields, Ld	24 2	" 1590 "	" 16th, "
Albany	Trail	Wm. Brown *et al*	42 68	" 1636 "	" 16th, "
Alpha	Goat River	Geo. Alexander	40 07	" 1587 "	Dec. 17th, "
Atwood	Trail	B. C. Gold Discovery Co. (foreign)	26 88	" 1231 "	Jan. 13th, 1898
Blue Elephant	Trail Creek	Rochester G. M. Co.	51 47	" 1280 "	" 18th, 1897
Butte	"	Butte Gold-Copper M. Co (f'n)	25 17	" 1148 "	" 28th, "
Badger	"	J. Lineham and R. F. Dodd	32 76	" 1227 "	" 28th, "
Black Horse	"	W. J. Harris	20 31	" 1059 "	July 22nd, "
Boice	"	Imperial G. M. Co	29 07	" 1340 "	May 7th, "
Broadview	Trout Lake	Lillooet, Fraser R. & Cariboo Gold Fields, Ld.	48 16	" 1550 "	" 10th, "
Buckeye	Trail Creek	S. J. Graham *et al*	51 65	" 1517 "	" 11th, "

WEST KOOTENAY.—*Continued.*

Name of Claim.	District.	Name of Grantee.	Acres.	Description.	Date of Grant.
Bolder	Trail Creek	J. J. Henager *et al*	37.91	Lot 1631, G. 1	May 12th, 1897
Black Rock	〃	Black Rock M. Co. (foreign)	23.74	〃 1821 〃	July 28th, 〃
Blue Grouse	Slocan	Sword & White	47.45	〃 1846 〃	Aug. 5th, 〃
Belleview	Trail Creek	A. A. McKenzie *et al*	46.84	〃 1137 〃	Sept. 2nd, 〃
Belcher	〃	F. Guse *et al*	33.24	〃 1951 〃	〃 24th, 〃
Budwiser No. 2	Ainsworth	Can. Pac. M. and M. Co	31.00	〃 714 〃	Oct. 1st, 〃
Bryan	Trail Creek	J. A. Forin and J. W. Boyd	23.23	〃 1827 〃	〃 23rd, 〃
Bryan No. 4	Slocan	J. McNeill	44.00	〃 1581 〃	Nov. 16th, 〃
Beaver	〃	W. Kootenay Exp. & M. Co.	29.6	〃 1807 〃	〃 16th, 〃
Bounty	Ainsworth	P. E. Fisher	32.39	〃 2322 〃	Dec. 17th, 〃
Blue Jay	Slocan	E. H. Tomlinson and W. A. Hendry	17.57	〃 594 〃	〃 15th, 〃
Belle	Nelson	J. A. Coryell, Alex. Goyette and J. A. Quinlan	42.00	〃 2461 〃	Jan. 28th, 1898
Bonanza King	Slocan	Noble 5 Con. M. & M. Co. (foreign)	13.62	〃 465 〃	Dec. 15th, 1897
Cleopatra	Nelson	A. H. Kelly	42.74	〃 387 〃	Jan. 6th, 〃
Celtic Queen	Trail Creek	J. F. Herrick	50.30	〃 987 〃	〃 15th, 〃
Centre Star No. 2	〃	Rossland Star G. M. Co., Ld.	21.68	〃 1346 〃	〃 28th, 〃
Campbird	〃	G. E. Wilson	23.23	〃 1283 〃	Feb'y 16th, 〃
Consolation	〃	〃	46.16	〃 1282 〃	〃 16th, 〃
Corinth	Slocan	Jas. Gilhooly	25.00	〃 1264 〃	〃 18th, 〃
Christine	Trail Creek	J. L. Warner & A. W. Provand	15.58	〃 1219 〃	Mar. 12th, 〃
Curlew	〃	Jno. Earle & Jos. Vogel	34.48	〃 1220 〃	〃 16th, 〃
Copper Jack	〃	Trail Creek M. Co. (foreign).	20.94	〃 1185 〃	〃 22nd, 〃
Cambridge	〃	Jno. Elliott *et al*	25.08	〃 1224 〃	April 12th, 〃
Carnation	Slocan	Donald D. Mann	39.96	〃 575 〃	〃 15th, 〃
Comet	Trail Creek	D. R. McDonald	38.9	〃 1516 〃	May 8th, 〃
Cutter Fraction	Trout Lake	Lillooet, Fraser R. & Cariboo Gold Fields, Ltd	3.73	〃 1554 〃	〃 10th, 〃
Clipper Fraction	〃	Lillooet, Fraser R. & Cariboo Gold Fields, Ld	2.37	〃 1555 〃	〃 10th, 〃
Curley	Slocan	E. McNicholl *et al*	23.99	〃 1335 〃	June 4th, 〃
Cariboo	Trail Creek	D. McDermid and J. Dean	34.96	〃 1639 〃	July 22nd, 〃
Captain No. 3	〃	A. D. Provand	23.64	〃 1289 〃	〃 27th, 〃
Campbell	〃	Chas. Tetley	26.74	〃 1621 〃	〃 23rd, 〃
Cariboo	Slocan	Rambler & Cariboo G. M. Co.	16.14	〃 720 〃	〃 31st, 〃
California	〃	A. J. Merks *et al*	37.87	〃 918 〃	Sept. 10th, 〃
Colonial	Illecillewaet	Lillooet, Fraser R. & Cariboo Gold Fields, Ld	38.25	〃 1589 〃	〃 8th, 〃
Copper Glance		Lineham & Dodd	44.37	〃 1496 〃	〃 9th, 〃
Columbus	Trail Creek	David M. Shaw	38.12	〃 1671 〃	〃 24th, 〃
Chicora	Nelson	Montreal & B. C. Prospecting and P. Co., Ld	22.00	〃 364 〃	Oct. 7th, 〃
Crazy Horse	Trail Creek	Stack & McDonell	4.38	〃 1958 〃	〃 13th, 〃
C. B. & Q.	〃	A. T. Monteith	50.8	〃 1188 〃	〃 23rd, 〃
Columbus	Slocan	Wonderful Group M. Co	51.65	〃 1309 〃	〃 22nd, 〃
Coxey	Trail Creek	J. R. Cook and E. Johnson	40.85	〃 1221 〃	Nov. 16th, 〃
Cazabazua	Slocan	W. K. (B. C.) Exp. & M. Co.	34.22	〃 1528 〃	〃 16th, 〃
Celebration	Ainsworth	Columbia Min. Co., Vic. B C.	41.21	〃 1414 〃	Dec. 2nd, 〃
Climax	Slocan	R. Winegate *et al*	16.02	〃 1846A 〃	〃 3rd, 〃
Charlston	Trail	A. Jackson and J. Johnston.	12.62	〃 975 〃	〃 2nd, 〃
Cold Blow	Slocan City	F. S. Andrews	51.65	〃 2218 〃	〃 17th, 〃
Charleston	Ainsworth	R. F. Green	19.75	〃 2321 〃	〃 16th, 〃
Deadwood	Trail Creek.	C. W. Callahan	51.65	〃 1291 〃	Jan. 7th, 〃
Delacola	〃	Delacola G. M. Co., Ld	21.72	〃 1502 〃	Feb'y 12th, 〃
Dorothy	Illecillewaet.	Lanark Con. M. & Smelting Co., Ld	51.65	〃 1559 〃	Aug. 6th, 〃
Duluth	Slocan	P. M. Hayes & M. R. Rathburn	31.00	〃 1019 〃	April 30th, 〃
Daydawn	〃	F. Steele and S. B. Steele	12.9	〃 596 〃	〃 5th, 〃
Dragon	〃	Wm. Braden	35.77	〃 848 〃	〃 14th, 〃
Detroit Fraction	Trail Creek	Laura Hornshaw	26.55	〃 1192 〃	May 14th, 〃
Day Dawn Fraction	Slocan	M. C. Monaghan	7.02	〃 598 〃	〃 11th, 〃
Derby	Trail Creek	P. Aspinwall	48.21	〃 998 〃	〃 27th, 〃
Dublin Queen	Ainsworth	The Jackson Mines, Ld	51.65	〃 1167 〃	Aug. 4th, 〃
Despair	Slocan	H. W. Foster *et al*	25.25	〃 840 〃	〃 17th, 〃
Democrat	〃	W. B. Cash and J. G. Steel.	51.65	〃 1250 〃	Nov. 26th, 〃

West Kootenay.—*Continued.*

Name of Claim.	District.	Name of Grantee.	Acres.	Description.	Date of Grant
Dexter	Nelson	A. C. Flumerfelt	51.50	Lot 2012 G. 1	Dec. 2nd, 1897
Dexter Fraction	″	″	4 66	″ 2013 ″	″ 2nd, ″
Exchequer	″	A. H. Kelly	31.59	″ 391 ″	Jan. 7th, ″
Empress	Trail Creek	J. T. Bethune, A. J. McLellan and H. A. Munn	39.54	″ 991 ″	Mar. 15th, ″
Eden	″	W. M. Newton *et al*	30.96	″ 1127 ″	″ 16th, ″
Emma	Slocan	Byron N. White Co (foreign)	10 65	″ 1009 ″	″ 23rd, ″
Ephraim Fraction	″	Reco M. & Milling Co., Ld	6.17	″ 600 ″	April 7th, ″
Emerald	Trail Creek	Hirschel Cohen	22.44	″ 949 ″	″ 5th, ″
Eureka No. 1	″	The Old Flag G. M. Co., Ld.	51.65	″ 1136 ″	″ 6th, ″
Enterprise	Slocan	J. A. Finch	44.39	″ 1014 ″	May 4th, ″
Elba	Trail Creek	David Barr	40.67	″ 1614 ″	″ 31st, ″
East St. Louis	″	E. St. Louis G. M. Co., Ld	33.00	″ 1641 ″	June 28th, ″
Ego	″	D. B. Dewar	39.02	″ 1823 ″	Aug. 4th, ″
Ettie	″	Charles Tetley	49.12	″ 1622 ″	July 23rd, ″
Elise	Nelson	Elise G. M. Co.	28 89	″ 1310 ″	Aug. 5th, ″
Eureka	″	Montreal & B. C. Prospecting & Promoting Co., Ld	48.00	″ 399 ″	Oct. 7th, ″
Easter	Ainsworth	R. E. Lee Brown	35.2	″ 1427 ″	Nov. 16th, ″
Empire No. 5	Slocan	J. McNeill & C. A. Holland.	41.04	″ 1580 ″	″ 16th, ″
Emerald Hill	Ainsworth	R. E. Brown & E. Ewart	35.77	″ 1426 ″	Dec. 14th, ″
Falu	Trail Creek	Eastern G. M. Co. (foreign)	49 13	″ 1350 ″	Feb'y 16th, ″
Florence	″	Adelia Stussie *et al*	51 21	″ 1354 ″	April 9th, ″
Flossie L	″	Cyrus Happy	10.86	″ 1301 ″	May 4th, ″
Fairview	″	Fairview G. M. Co	37.63	″ 1058 ″	July 16th, ″
Florian Fraction	Illecillewaet.	Lillooet, F. R. & Cariboo G. F., Ld	39.6	″ 1591 ″	Nov. 26th, ″
Fresno	Ainsworth	R. E. Lee Brown	8.35	″ 1423 ″	″ 16th, ″
Grover	Slocan	C. W. Callahan	47.1	″ 1330 ″	Jan. 17th, ″
Golden Dawn	Trail Creek	C. Glass & T. R. Morrow	44.85	″ 1349 ″	Mar. 1st, ″
Golden Horn	″	A. D. Provand	17 86	″ 1234 ″	″ 4th, ″
Galena	Slocan	W. A. Hendryx, G. A. Kirk & C. A. Holland	10.18	″ 593 ″	″ 11th, ″
Gold Star	Trail Creek	V. D. Williamson & J. L. Campbell	49.42	″ 1191 ″	April 8th, ″
Gopher	″	Gopher G. M. Co	18 60	″ 1050 ″	May 4th, ″
Golden Horn	Nelson	J. Pitre	29.5	″ 1711 ″	″ 5th, ″
Gold Queen	Trail Creek	Gold Queen M. & R. Co	47.66	″ 1352 ″	″ 19th, ″
Green Mountain	″	H. E. Lowry & J. B. McArthur	42.00	″ 638 ″	July 21st, ″
Gold Bug No. 2	″	M. R. Galusha *et al*	17.3	″ 1154 ″	″ 27th, ″
Goldie	″	Goldie Rene M. Co	28.08	″ 1759 ″	″ 27th, ″
Goulah	″	H. L. A. Kellar *et al*	39.24	″ 1452 ″	Sept. 8th ″
Green Horn	Slocan	J. & D. McNeill	11.21	″ 1306 ″	″ 24th, ″
Goodenough	Nelson	G. H. Andrews	18.4	″ 392 ″	Nov. 16th, ″
Good Friday	Trail Creek	H. Pahl & Toklas	48 45	″ 967 ″	″ 16th, ″
Golden Butterfly	″	A. D. Provand	42.99	″ 1217 ″	″ 16th, ″
Golden Eagle	Slocan	A. C. Flummerfelt	46.92	″ 1845A ″	″ 16th, ″
Helen No. 2	Trail Creek	W. J. C. Wakefield	43.21	″ 1151 ″	Jan. 18th, ″
Hoper	Illecillewaet.	Lanark Con. M. & S. Co., Ld	51.65	″ 1558 ″	Aug. 6th, ″
Home Fraction	″	Lillooet, F. R. & Cariboo G. F., Ld	19 4	″ 1561 ″	″ 6th, ″
Hard Bargain	Trail Creek	Hope, Johnson *et al*	30.11	″ 1129 ″	April 28th, ″
Highland	Slocan	J. McClements *et al*	32 02	″ 1337 ″	June 4th, ″
Hidden Treasure	Trail Creek	War Eagle Con. M. Co	43.36	″ 930 ″	Sept. 3rd, ″
Hope	Slocan	H. W. Forster *et al*	39 00	″ 840 ″	Aug. 17th, ″
Hidden Treasure	Nelson	Montreal & B. C. P. & P. Co., Ld	51 65	″ 503 ″	Oct. 6th, ″
″ ″	Slocan	Geo. Alexander	15.29	″ 1715 ″	″ 6th, ″
Hazel C	Ainsworth	R. E. Lee Brown	28.9	″ 691 ″	Nov. 16th, ″
Irene	″	J. C. Eaton	29 54	″ 1171 ″	Jan. 8th, ″
Iron Queen No. 1	Trail Creek	J. J. Kingsmill	37.58	″ 1504 ″	″ 26th, ″
Independent	″	Independent M. Co., Ld	17.16	″ 1275 ″	Feb'y 12th, ″
Iron Colt	″	P. Burns & W. A. Campbell.	16.20	″ 796 ″	Mar. 20th, ″
Imperial Fraction	″	Imperial G. M. Co	17.23	″ 1341 ″	May 7th, ″
Idler	Slocan	Idler M. Co	27.45	″ 857 ″	April 29th, ″
Ibex	Trail Creek	Ibex M. Co., Ld	20.13	″ 1618 ″	May 13th, ″
Isabella	Revelstoke	Lanark Con. M. & S. Co., Ld.	48.00	″ 1557 ″	June 2nd, ″

WEST KOOTENAY.—*Continued.*

Name of Claim.	District.	Name of Grantee.	Acres.	Description.	Date of Grant.
Ivanhoe No. 3	Trail Creek	J. H. Adams	39.12	Lot 1629 G. 1	July 23rd, 1897
Idaho No. 2	Slocan	J. B. McArthur *et al*	31.33	″ 1013 ″	Aug. 5th, ″
Isabella No. 2	Trail Creek	Nanaimo & Rossland M. Co.	44.21	″ 1355 ″	Sept. 23rd, ″
Illinois	Ainsworth	P. E. Fisher	20.66	″ 2327 ″	Dec. 17th, ″
Ivanhoe No. 2	″	M. Stevenson & G. Rumpf	13.11	″ 603 ″	″ 16th, ″
Jennie	Slocan	B. N. White Co	5.34	″ 546 ″	Mar. 23rd, ″
John Plummer Fraction	″	Wm. Braden	5.12	″ 851 ″	April 29th, ″
Juliet	Trail Creek	English-Can. G. M. Co., Ld.	51.65	″ 1620 ″	July 28th, ″
Joker	″	W. Claffy *et al*	17.07	″ 1690 ″	April 29th, ″
Jennie No. 3	Slocan	J. A. McDonell	23.10	″ 1713 ″	May 14th. ″
June	Trail Creek	A. D. Provand	42.97	″ 1216 ″	July 27th, ″
Jersey	″	J. M. Harris *et al*	42.22	″ 646 ″	Sept. 28th, ″
Jo-Jo	″	C. Dawson *et al*	28.76	″ 1160 ″	″ 30th, ″
Jenny Lind	Slocan	W. K. (B. C.) E. & M. Co., Ld	41.26	″ 1806 ″	Nov. 26th, ″
Kaslo	Ainsworth	G. Alexander *et al*	50.56	″ 822 ″	May 26th, ″
Kate	Slocan	C. W. Callahan	51.65	″ 1333 ″	Jan. 7th, ″
Knight Templar	Trail Creek	W. J. C. Wakefield	51.65	″ 1155 ″	Feb'y 10th. ″
Kootenay Star	Ainsworth	The Jackson Mines, Ld.	36.80	″ 1168 ″	Aug. 4th, ″
Keivi	Trail Creek	H. L. A. Kellar *et al*	35.39	″ 1450 ″	Sept. 8th, ″
Kootenay Fraction	″	Trail Mining Co	.10	″ 1198 ″	Oct. 4th, ″
Knoxville	Slocan	Noble Five Con. M. & M. Co	11.72	″ 466 ″	Dec. 15th, ″
Lanark	Illecillewaet	Lanark Con. M. & S. Co., Ld	8.00 37.65	″ 1592 ″ ″ 1592A ″	June 2nd, ″
La Regina	Trail Creek	La Regina G. M. Co	19.28	″ 1128 ″	Feb'y 12th, ″
Lucetta	Slocan	Noble Five Con. M. & M. Co.	2.77	″ 599 ″	Mar. 11th, ″
Lookout No. 2	″	Wonderful Group M. Co.	44.31	″ 1308 ″	April 7th, ″
Lucky Jim	″	Wm. Braden	29.94	″ 844 ″	″ 12th, ″
Lone Jack	Trail Creek	Silver Bell M. Co., Ld	39.23	″ 1619 ″	May 11th, ″
London	Slocan	London Hill M. & Dev. Co.	47.29	″ 1416 ″	″ 17th, ″
Little Dalles	Trail Creek	A. D. Provand	6.74	″ 1215 ″	June 4th, ″
Little Darling	″	Cyrus Happy	25.00	″ 1043 ″	July 28th, ″
Lone Star	Slocan	J. W. Sword *et al*	51.60	″ 1844 ″	Aug. 5th, ″
Livingstone	Trail Creek	E. R. C. Clarkson	9.6	″ 1500 ″	July 30th, ″
Louise	″	Nanaimo-Rossland M. Co., Ld	41.01	″ 1642 ″	Sept. 9th, ″
Little Dot		Roberts & Phillips	49.35	″ 1356 ″	″ 23rd, ″
Little Joe	″	E. S. Topping *et al*	38.88	″ 1695 ″	Oct. 5th, ″
Last Link	Ainsworth	R. E. Lee Brown	3.27	″ 1425 ″	Nov. 16th, ″
Lincoln	″	Columbia M. Co	40.09	″ 1413 ″	″ 16th, ″
Lighthart	Nelson	Dundee G. M. Co	46.2	″ 1862 ″	″ 26th, ″
Maid of Erin	Trail Creek	R. E. Lee G. M. Co	32.35	″ 1293 ″	Jan. 18th, ″
Mary May	″	A. E. Fritsh	51.65	″ 1492 ″	Feb'y 16th, ″
Marion	″	B. C. Syn., Ld., & J. L. Mulroney	31.38	″ 1286 ″	″ 11th, ″
Maple Leaf	Illecillewaet	Lillooet, F. R. & Cariboo G. F., Ld	21.65	″ 1562 ″	Aug. 6th, ″
Miartonomali	Slocan	James Gilhooly	40.3	″ 1461 ″	Feb'y 19th, ″
Mascott	Trail Creek	Big Three G. M. Co	43.53	″ 1341 ″	″ 22nd, ″
Mabel	″	W. A. Ritchie	9.4	″ 1202 ″	Mar. 10th, ″
Midnight	″	Provand & Warner	43.63	″ 1186 ″	″ 12th, ″
Maud S.	″	B. A. True, C. B. Etnier & David Cromie	24.5	″ 1442 ″	April 7th, ″
Moses	Slocan	Wm. Braden	27 06	″ 856 ″	″ 15th, ″
Mugwump	Nelson	Oliver Blair	34.8	″ 1714 ″	May. 5th, ″
Madison	Slocan	Wm. C. Price	50.03	″ 1411 ″	June 8th, ″
Mardon Fractional	″	F. A. Henneberg & W. C. Price	.90	″ 1420 ″	″ 8th, ″
Minnie	Trail Creek	J. P. Graves *et al*	32.75	″ 1610 ″	July 31st, ″
Marie	″	D. F. Johnston	51 65	″ 1518 ″	″ 27th, ″
Mocking Bird	″	D. F. Johnston & J. T. Johnston	41.34	″ 1766 ″	″ 30th, ″
Mayflower No. 2.	″	J. Coates	44.50	″ 1274 ″	Aug. 5th, ″
Minniapolis	Slocan	Erie M. & M. Co., Ld	48 5	″ 578 ″	″ 5th, ″
Mother Lode	Trail Creek	Richard Daniel *et al*	30.00	″ 1764 ″	Sept. 17th, ″
Mountain Chief	″	Dickson & McRae	36.3	″ 1515 ″	Oct. 6th, ″
Millsite		Thos. J. Lendrum	5.00	″ 592 ″	″ 6th, ″
March	Slocan	Van. & B. C. Gen. Exp. Co., Ld	48.80	″ 1392 ″	Nov. 26th, ″
Mascot Fraction	Trail Creek	Mascot G. M. Co., Ld	15.36	″ 1298 ″	″ 26th, ″
Maud S.	Ainsworth	R. E. Lee Brown	50.5	″ 1422 ″	″ 26th, ″

West Kootenay. *Continued.*

Name of Claim.	District.	Name of Grantee.	Acres.	Description.	Date of Grant.
Minnie Moore No. 1	Trail	M. A. L. Archer & P. W. Peterson	49.25	Lot 1791, G. 1	Dec. 15th, 1897
Maud E.	Slocan	Noble Five Con. M. & M. Co	15.45	„ 163 „	„ 15th.
Magog	Goat River	Geo. Alexander	49.1	„ 1586 „	„ 17th.
Mary Farley	Trail	J. J. Kearns *et al*	27.65	„ 1702 „	„ 17th.
North Star No. 3	Trail Creek	Rossland Star G. M. Co., Ld.	26.49	„ 1345 „	Jan. 28th.
Norway	„	L. J. McAlee & W. F. Case	51.65	„ 1501 „	April 6th.
Norway	„	Bruce G. M. Co	13.25	„ 1628 „	April 6th.
Nicolet	Ainsworth	J. Thompson, Jr.	18.55	„ 602 „	„ 9th.
Neptune	Trail Creek	W. D. McFadden & D. O'Sullivan	37.1	„ 1495 „	May 6th.
Noonday	Slocan	C. McNicholl *et al*	51.65	„ 1334 „	June 4th.
Northern Bell	Ainsworth	The Jackson Mines, Ld	51.65	„ 1166 „	„ 4th.
Noble Three	„	Noble Three M. & M. Co., Ld	28.52	„ 1435 „	Oct. 14th.
Nancy Hanks	„	R. E. Lee Brown	7.66	„ 1421 „	Nov. 26th.
Nevada	Trail Creek	Hy. Stoll & Rugh	33.67	„ 966 „	Dec. 4th.
Noble Five	Slocan	Noble Five Con. M. & M. Co	10.56	„ 467 „	„ 15th.
Orizaba	Trail Creek	W. J. C. Wakefield	42.1	„ 1153 „	Feb. 9th.
Oak Leaf	Illecillewaet	Lillooet, F. R. & Cariboo G. F. Ld	36.00	„ 1563 „	Aug. 7th.
Old Sonoma	Trout Lake	Lillooet, F. R. & Cairboo G. F., Ld	10.09	„ 1551 „	May 10th.
Ottawa No. 1	Trail Creek	A. E. Osler	43.18	„ 1193 „	June 3rd.
Opher	Ainsworth	The Jackson Mines, Ld	35.71	„ 1169 „	Aug. 4th.
Old Hundred	Trail Creek	C. R. Hamilton	14.45	„ 1617 „	July 28th.
Okanagan	Slocan	Dardanelles M. & M. Co., Ld	45.41	„ 454 „	Nov. 16th.
Ottawa No. 2	„	W. K. (B. C.) Exp. & M. Co., Ld	35.20	„ 1805 „	„ 16th.
Oro Fino	Nelson	A. C. Flumerfelt	38.70	„ 2011 „	Dec. 2nd.
Old Bill	„	Dundee G. M. Co., Ld	51.65	„ 1863 „	„ 2nd.
Peerless (Revised)	Slocan	C. W. Callahan	31.38	„ 1332 „	Jan. 7th.
Phœnix (Revised)	Trail Creek	W. J. C. Wakefield	20.79	„ 1152 „	Feb. 9th.
Pug	„	Columbia & Ontario G. M. Co	30.16 19.61	„ 1363 „ „ 1363A „	Aug. 4th.
Phroso	Slocan	Wm. Braden	11.51	„ 852 „	April 8th.
Prince of Wales	Trail Creek	J. McMartin	51.00	„ 1625 „	May 7th.
Phillipsburg	Trout Lake	Lillooet, F. R. & Cariboo G. F., Ld	26.76	„ 1552 „	„ 10th.
Portland	Trail Creek	Portland G. M. Co	51.65	„ 1445 „	„ 11th.
Pacific	Slocan	F. & S. B. Steele	1.10	„ 597 „	„ 8th.
Pirate	„	T. Marks	44.60	„ 1304 „	„ 25th.
Peak	Trail Creek	M. E. Raummelmeyer & F. W. Hunt	9.69	„ 1209 „	July 28th.
Purcell	Slocan	Purcell Min. Corporation, Ld	13.62	„ 849 „	Aug. 25th.
Poor Property	Trail Creek	J. Quilliam & H. S. Wadsworth	50.45	„ 1273 „	Sept. 24th.
Parker	Nelson	Dundee G. M. Co	51.65	„ 1861 „	Nov. 26th.
Queen's Own	Trail Creek	J. A. Kirk	19.82	„ 1616 „	May 8th.
Read	Slocan	E. E. Evans	22.70	„ 1247 „	Jan. 14th.
Robert E. Lee	Trail Creek	R. E. Lee G. M. Co	51.65	„ 1292 „	„ 18th.
Rob Roy	„	B. C. Syndicate	18.44	„ 1290 „	Feb. 11th.
Red Fox	Illecillewaet	Lanark Con. M. & S. Co., Ld	51.65	„ 1560 „	Aug. 6th.
Red Point	Trail Creek	Red Point G. M. Co., Ld.	51.65	„ 1200 „	Mar. 12th.
Rhoderick Dhu	„	Rhoderick Dhu G. M. Co., Ld	44.00	„ 1493 „	April 7th.
Roadley	Slocan	Wm. Braden	38.46	„ 858 „	„ 15th.
Roanoke Fraction	„	„	2.89	„ 844 „	„ 7th.
Rockland	Nelson	Jerome Pitre	32.7	„ 1709 „	May 5th.
Robertson Fraction	„	R. B. Wood	0.07	„ 1712 „	„ 5th.
Rainy Day	Trail Creek	Rainy Day G. M. Co	45.75	„ 1339 „	„ 8th.
Red Oak	„	T. Oliver *et al*	49.35	„ 1162 „	June 3rd.
Rambler	Slocan	Rambler & Cariboo Con. G. & M. Co	32.95	„ 1246 „	„ 8th.
Rienzi	„	C. W. Callahan	18.3	„ 1262 „	July 27th.
Rabbit Paw	„	Star M. & M. Co., Ld	9.79	„ 1252 „	„ 27th.
Rene	Trail Creek	Goldie Rene M. Co	38.05	„ 1520 „	„ 27th.
Randolph	„	Randolph G. M. Co	17.98	„ 1279 „	„ 28th.
Red Eagle	„	Red Eagle G. M. Co., Ld	22.71	„ 1615 „	„ 28th.
R. Lee	„	War Eagle Con. M. Co	13.87	„ 1187 „	Sept. 2nd.

WEST KOOTENAY.—*Continued.*

Name of Claim.	District.	Name of Grantee.	Acres.	Description.	Date of Grant.
Ruth	Slocan	H. W. Forster *et al*	18.41	Lot 841, G. 1	Aug. 17th, 1897
Ruth Fraction	〃	〃 〃	12.3	〃 1845 〃	〃 17th, 〃
Right Bower	Ainsworth	Victoria M. & Dev. Co	33.65	〃 1882 〃	Oct. 22nd, 〃
Robertson	Slocan	W. K. (B. C.) Exp. & M. Co., Ld	20.54	〃 1808 〃	Nov. 26th, 〃
Surprise	Trail Creek	Paul Blackmar	26.41	〃 693 〃	Jan. 8th, 〃
Stevenson	Slocan	C. W. Callahan	38.76	〃 1331 〃	〃 7th, 〃
Sunnyside	Trail Creek	C. G. Reeder	17.86	〃 1503 〃	Feb. 2nd, 〃
Snowshoe	〃	Big Three G. M. Co	46.00	〃 1347 〃	〃 22nd, 〃
Southern Belle	Trail Creek	〃 〃	29.8	〃 1348 〃	Feb. 22nd, 〃
Slocan King	Slocan	Byron N. White Co	19.00	〃 547 〃	Mar. 23rd, 〃
Sultana	Trail Creek	Chas. P. Warren	51.65	〃 1494 〃	April 7th, 〃
St. George	Slocan	Wm. Braden	20.31	〃 846 〃	〃 14th, 〃
Shields	〃	〃	46.99	〃 847 〃	〃 14th, 〃
Shiloh	〃	〃	47.77	〃 850 〃	〃 15th, 〃
Snelling	Ainsworth	Josiah Thompson, Jr	20.66	〃 601 〃	〃 9th, 〃
Slocan Queen	Slocan	John A. Finch	51.00	〃 1015 〃	May 4th, 〃
South Bend	Trail Creek	J. J. Hennager & A. Wilson.	35.68	〃 1635 〃	〃 6th, 〃
Skiff Fraction	Trout Lake	Lillooet, F. R. & Cariboo G. F., Ld	.39	〃 1556 〃	〃 10th, 〃
Silversmith	Slocan	Byron N. White Co	13.60	〃 1010 〃	〃 10th, 〃
Stock Exchange	Trail Creek	Ottawa G. M. Co., Ld	27.43	〃 1609 〃	〃 11th, 〃
Snowstorm	Slocan	Ed. Mahon	11.08	〃 920 〃	〃 8th, 〃
Starlight No. 3	〃	Last Chance M. & M. Co	33.61	〃 595 〃	〃 11th, 〃
Sunday Sun No. 2	Trail Creek	W. G. Estep	15.18	〃 1161 〃	June 4th, 〃
Sterling Fraction	〃	Wm. Caldwell	3.57	〃 1447 〃	July 23rd, 〃
Star of the East	Nelson	Thos. A. Brassey	37.33	〃 1312 〃	〃 22nd, 〃
Star of the West	〃	〃	34.89	〃 1311 〃	〃 27th, 〃
Scarabacus	Trail Creek	Hermann L. A. Keller *et al*	26.84	〃 1415 〃	Sept. 8th, 〃
Superior	Ainsworth	Can. Pac. M. & M. Co	27.87	〃 746 〃	Oct. 1st, 〃
Sadie	Trail Creek	John N. Lee	14.66	〃 1393 〃	〃 13th, 〃
Skookum	Ainsworth	Joseph R. Hofflin	17.66	〃 604 〃	Nov. 26th, 〃
St. Paul	Trail Creek	F. Guse & E. Johnson	31.41	〃 1760 〃	〃 26th, 〃
Silver Glance Fraction	Ainsworth	John S. Baker	14.7	〃 1439 〃	Dec. 2nd, 〃
Tenderfoot	Slocan	E. E. Evans	17.19	〃 1248 〃	Jan. 15th, 〃
Tourmaline	Trail Creek	Robert F. Dodd	10.55	〃 457 〃	〃 28th, 〃
Tip Top	〃	Trail Mining Co	35.24	〃 798 〃	Mar. 22nd, 〃
Twin	Ainsworth	J. B. McArthur & D. F. Strobeck	46.53	〃 591 〃	〃 22nd, 〃
Third of July	Slocan	London Hill M. & Dev. Co	51.65	〃 1417 〃	May 17th, 〃
Trilby	Trail Creek	John McMartin	47.76	〃 1626 〃	June 3rd, 〃
Tramway	〃	W. N. Dunn & M. Sullivan	22.71	〃 1826 〃	July 22nd, 〃
Trenton	〃	S. L. Williams & J. Benn	51.00	〃 1361 〃	June 2nd, 〃
Triumph	〃	Victory-Triumph G. M. Co., Ld	51.65	〃 1364 〃	〃 14th, 〃
Tariff	Ainsworth	Wm. Braden	18.97	〃 1714 〃	Sept. 30th, 〃
Union Jack	Trail Creek	L. H. Merrill	47.30	〃 1288 〃	April 6th, 〃
Union Jack	Nelson	J. B. Daly & J. H. Young	14.70	〃 244 〃	Dec. 2nd, 〃
Venetia Boy	〃	John Johnson	15.59	〃 408 〃	Mar. 9th, 〃
Vancouver No. 2	Slocan	Vancouver Group M. Co., Ld	43.32	〃 739 〃	June 8th, 〃
Victory	Trail Creek	Victory-Triumph G. M. Co., Ld	26.3	〃 1365 〃	June 14th, 〃
Volney	〃	B. C. Gold Discovery Co	36.00	〃 1441 〃	Sept. 2nd, 〃
Venus	〃	〃 〃	22.00	〃 1213 〃	〃 24th, 〃
Whitewater	Ainsworth	J. C. Eaton	42.90	〃 1170 〃	Jan. 8th, 〃
Wild Goose No. 2	Slocan	Albert Behne	36.9	〃 1263 〃	Feb. 18th, 〃
Windsor	〃	Byron N. White Co	27.25	〃 1016 〃	May 10th, 〃
Wisconsin	Trail Creek	L. J. McAtee	42.4	〃 1692 〃	〃 11th, 〃
Wild Goose	Slocan	Noble Five Con. M. & M. Co	33.10	〃 614 〃	〃 11th, 〃
Winnipeg	Trail Creek	Douglas F. Johnston	41.8	〃 1519 〃	July 27th, 〃
White Swan	〃	War Eagle Con. M. Co	30.66	〃 929 〃	Sept. 3rd, 〃
White Elephant	〃	Nanaimo-Rossland M. Co	42.12	〃 1357 〃	〃 23rd, 〃
Wide West No. 2	〃	T. W. Stack & C. McDonell.	51.65	〃 1953 〃	Oct. 13th, 〃
Wakefield	Slocan	W. K. (B. C.) Explor. & M. Co., Ld	51.15	〃 1527 〃	Nov. 26th, 〃
Wallingford	Trail	M. A. L. Archer & P. W. Peterson	51.5	〃 1790 〃	Dec. 15th, 〃

West Kootenay. *Concluded.*

Name of Claim.	District.	Name of Grantee.	Acres.	Description.	Date of Grant
World's Fair	Slocan	Noble Five Con. M. & M. Co	15.28	Lot 164 G. 1	Dec. 15th, 1897
Young America	Trail Creek	Young Brit. Am. G M. Co., Ld	37 68	" 1233 "	Jan. 28th, "
Yalo	"	Yale Gold-Copper M. Co., Ld	23 11	" 533 "	April 6th, "
Ymir	Nelson	Joseph Pitre	40.97	" 1708 "	May 5th, "

Lillooet.

Ample	Lillooet	John Marshall	40.28	Lot 335, G 1	Jan. 14th, 1897
Golden Eagle	"	Golden Cache M. Co	47 00	" 370 "	May 12th, "
Golden Stripe	"	" "	41.18	" 373 "	" 13th, "
Jumbo	"	" "	24.98	" 376 "	" 13th, "
North Star	"	" "	49.70	" 371 "	" 12th, "
Ruby	"	" "	44.95	" 372 "	" 13th, "
Whale	"	John Marshall	51.65	" 334 "	Jan. 11th, "

New Westminster.

Brady	Nanaimo	Vic.-Texada G. M. Co., Ld	82	Lot 124	Sept. 17th, 1897
Francis	"	" " "	9.7	" 122	" 13th, "
Neptune	N. West'mr.	Bowen Island G. M. Co	46.06	" 1658, G 1	July 21st, "
Potosa	Texada Isl'd.	Vic.-Texada G. M. Co., Ld	32.73	" 121 Tex.	Sept. 10th, "
Porpoise	Nanaimo	" " "	1.44	" 123, G 1	" 17th, "

Sayward and Coast.

Alexandra	Nanaimo	H. Rhodes	44.1	Lot 225, R 1	Feb. 19th, 1897
Climax	"	Texada-Kirk Lake, G. M. Ld,	46.00	" 49 "	April 5th, "
Duchess	"	H. Rhodes	.....	" 231 "	Feb. 19th, "
Duke	"	"	45.40	" 229 "	" 19th, "
Dorothy Morton	"	P. J. Chick & C. Moody	51 65	" 253 "	Dec. 2nd, "
Highland Laddie	"	H. Rhodes	45.90	" 228 "	Feb. 19th, "
Last Link	"	Texada-Kirk Lake G. M., Ld	30.89	" 51	April 5th, "
Lindsay	"	" " "	39.17	" 50	" 5th, "
Shoo Fly	"	A. J. Smith & D. Leahy	31.9	" 243 "	June 8th, "
Texada	"	Texada-Kirk Lake G. M., Ld	45.03	" 48	April 12th, "
Victoria	"	" " "	51.65	" 47	" 12th, "
White Pine	"	Channe Mining Co	46.93	" 234, G 1	July 30th, "

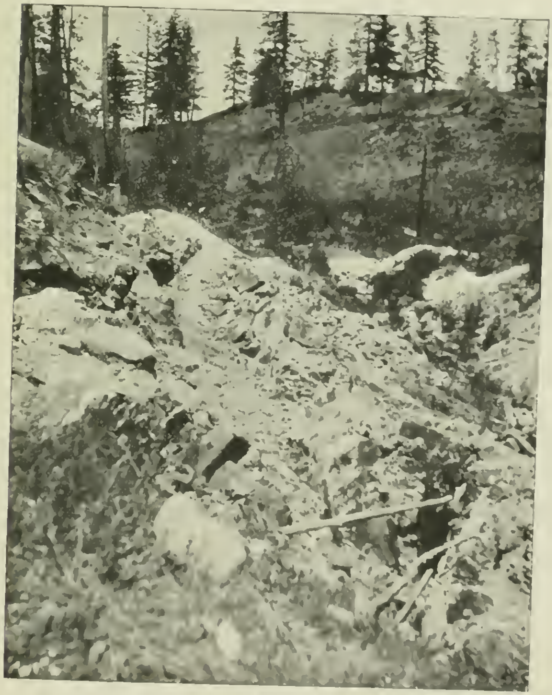
Yale.

Alice	Osoyoos	Sir Charles Ross	30.26	Lot 698, G 1	Mar. 12th, 1897
Argentum	Yale	R. Marpole *et al*	49.9	" 830 "	April 30th, "
Barbara	Osoyoos	G. A. Rendell	28.5	" 817	Oct. 13th, "
Bullion	"	Lafrenz, Tait & Railston	16.72	" 734 "	Nov. 16th, "
Comstock	"	W. A. Dier	51.65	" 729 "	Sept. 9th, "
Crown Silver	"	W. L. Hogg	18 8	" 789 "	Dec. 2nd, "
Dundee	"	J. Sutherland & R. Wood	42.00	" 601 "	Jan. 15th, "
Douglas Deighton	Yale	W. Teague & B. Douglas	20.66	" 631	Aug. 3rd, "
Evening Star	Osoyoos	John Stevens *et al*	19.00	" 543 "	April 9th, "
Elmore	"	A. A. Davidson	44 19	" 733 "	Sept. 9th, "
Fontenoy	"	Duncan A. Cameron	47 86	" 752 "	Oct. 22nd, "
Gold Drop	"	F. C. Innes	32 29	" 899 "	Nov. 16th, "
Homestake	Kamloops	R. Marpole *et al*	51 65	" 827 "	April 30th, "

YALE.—*Concluded.*

Name of Claim.	District.	Name of Grantee.	Acres.	Description.	Date of Grant.
Helen	Osoyoos	Boundary-Helen G. M. Co., Ld	29.94	Lot 691 G. 1	Oct. 12th, 1897
Jumbo	"	T. L. Savage & Rendall	39.3	" 655 "	Feb. 18th, "
Last Chance	"	Phil Austin *et al*	19.2	" 660 "	" 18th, "
Lexington	"	G. W. Rumberger *et al*	20.66	" 645 "	Jan. 15th, "
Last Chance	"	Republic G. M. Co	40.2	" 644 "	April 7th, "
Lemon	"	Matthew J. Greevy	51.65	" 760 "	Nov. 16th. "
Last Chance	"	Boundary Creek M. Co	46.83	" 753 "	Oct. 22nd, "
Morrison	"	George T. Crane	34.5	" 654 "	Feb. 18th, "
Minniehaha	"	Ainsley Megrau	50.7	" 680 "	Mar. 10th, "
Maple Leaf	Yale	R. Marpole *et al*	49.8	" 828 "	April 30th, "
Maple Leaf	Osoyoos	Jas. Lynch	13.63	" 613 "	Aug. 5th, "
Monarch	"	Thos. Humphrey	51.13	" 701 "	" 4th, "
Mammoth	"	Dier & Davidson	50.06	" 545 "	Nov. 26th, "
Mamont	"	Ferdinand Dittmer	45.89	" 879 "	Dec. 2nd, "
Nonsuch	"	Republic G. M. Co	16.50	" 389 "	April 6th, "
Oro	"	John Douglas	16.68	" 614 "	Mar. 10th. "
Old England	"	Henry Nicholson	51.3	" 658 "	Nov. 16th, "
Potter Palmer	"	Edwin S. Graham	47.18	" 661 "	April 29th, "
Pathfinder	"	Pathfinder Mining, Reduct'n & Investment Co	51.65	" 782 "	Nov. 26th, "
Queen	Yale	Wm. Teague	20.66	" 63 "	Aug. 3rd, "
Sunset	Osoyoos	W. L. Hogg	20.2	" 788 "	Dec. 2nd, "
Texas	"	Edwin S. Graham	32.02	" 662 "	April 30th, "
Troublesome	Yale	R. Marpole *et al*	38.25	" 829 "	" 30th, "
Tamarack	Osoyoos	Franklin Riffle	49.60	" 783 "	Nov. 26th, "
Vernon	"	Hugh Cameron	45.3	" 759 "	" 26th, "
War Eagle	"	R. Denzler & T. W. Johnson	20.68	" 678 "	April 8th, "

EIGHT-FOOT QUARTZ VEIN, "BROWN BEAR."



THIRTY FOOT QUARTZ VEIN, "MORNING STAR,"
FAIRVIEW, B. C.

GOLD COMMISSIONERS AND MINING RECORDERS.

Mining Divisions.	Name of Recorder.	Address.	Name of Gold Commissioner.	Address.
Cassiar, etc.—				
Stickine	James Porter	Telegraph Creek	James Porter	Telegraph Creek.
Liard	"	"		
McDame	"	"		
Laketon	"	"		
Skeena	John Flewin	Fort Simpson	W. S. Gore	Victoria.
Omineca (Land Rec'd'g D.	Ezra Evans	Manson Creek		
Bennett Lake	W. J. Rant	Bennett Lake	W. J. Rant	Bennett Lake.
Cariboo—				
Omineca	W. V. Bowron	Barkerville	Jno. Bowron	Barkerville.
Richfield	"	"		
Quesnelle	W. Stephenson	Quesnelle Forks		
Victoria	W. S. Gore	Victoria	W. S. Gore	Victoria.
Yale—				
Kamloops	E. T. W. Pearse	Kamloops	G. C. Tunstall	Kamloops.
Yale	Wm. Dodd	Yale		
Similkameen	H. Hunter	Granite Creek		
Vernon	J. C. Tunstall	Vernon	C. A. R. Lambly	Osoyoos.
Osoyoos	J. R. Brown	Osoyoos		
Kettle River	W. G. McMynn	Midway		
Grand Forks	S. R. Almond	Grand Forks		
East Kootenay—				
Donald	J. Stirret	Donald	J. E. Griffith	Donald.
Golden	F. C. Lang	Golden		
Windermere	G. Goldie	Windermere		
Fort Steele	C. M. Edwards	Fort Steele	J. F. Armstrong	Fort Steele.
"	M. Phillips	Tobacco Plains		
West Kootenay—				
Revelstoke	W. G. Paxton	Revelstoke	J. D. Sibbald	Revelstoke.
Illecillewaet	W. Scott	Illecillewaet		
Lardeau		Lardeau		
Trout Lake	W. H. Vickers	Trout Lake		
Slocan	A. Sproat	New Denver	O. G. Dennis	Nelson.
Ainsworth	John Keen	Kaslo		
Nelson	R. F. Tolmie	Nelson		
Trail Creek	J. Kirkup	Rossland		
Goat River	J. C. Rykert	Rykert's		
Slocan City	H. P. Christie	Slocan City		
Arrow Lake	F. G. Fauquier	Nakusp		
Nanaimo	M. Bray	Nanaimo	M. Bray	Nanaimo.
Alberni	Thos. Fletcher	Alberni	Thos. Fletcher	Alberni.
Lillooet—				
Clinton	F. Soues	Clinton	F. Soues	Clinton.
Lillooet	C. A. Phair	Lillooet		
New Westminster	D. Robson	New Westminster	W. S. Gore	Victoria.

NEW WESTMINISTER DIVISION.

D. ROBSON, MINING RECORDER.

"I have the honour to submit some statistics of the mining business of this division during the year 1897, accompanied by a brief reference to some of the mining camps. In my report for 1896, it was stated that 'the mining outlook in this division for 1897 is very hopeful.' This remark has, I think, been justified by the year's operations, as shown by the following comparative statement of the mining business of the division during the past three years :—

	1895.	1896.	1897.
Free Miner's Certificates issued	468	1,150	2,760
Mineral claims recorded	182	518	1,883
Certificates of work issued	12	37	199
Conveyances recorded	3	81	295
Revenue from Free Miner's Certificates	$2,340	$5,900	$22,724
do other sources	655	1,762	6,139
Total mining revenue	$2,995	$7,662	$28,863

Of the Free Miner's Certificates mentioned above, 125 were issued at the Vancouver agency, and 24 at Douglas. About the middle of the year a considerable area of mining territory (lying between Jervis Inlet and Lewis Channel) was taken from this division and added to the Nanaimo district.

"Although a great deal of prospecting has been done, and a large number of claims have been located, it is to be regretted that there has been comparatively little work done in the development of mining properties. With the exception, perhaps, of a score of claims, the work done has not much exceeded that which was required to obtain a certificate of work. It should be remembered, however, that many of the claims were taken up late in the season, and are so situated that they could not be developed without large expenditure.

"In 1896 the 'Province' mine, on Harrison Lake, attracted the greatest attention of any mine in the division. In 1897 the Fire Mountain group of mines has been dividing public interest with the Harrison Lake group, and Pitt Lake has also attracted a good deal of attention. In these three groups the largest amount of development work has been done.

"On the 'Province' mine there has been spent about $10,000. There are three distinct lodes on the surface, which have been worked. The middle lode is almost perpendicular, and the other two converge towards this lode as they go down. It is believed that at a certain depth these three lodes will merge into one, and the company is now sinking a shaft through the middle lode, in the direction of the supposed combination. There has been 150 feet of shafting and 250 feet of tunnelling done on this mine. Assays range all the way from $1 to $2,000 to the ton—but assays of small samples are never reliable as a basis of value. About three cars of ore were shipped to the smelter last summer, and gave an average return of $27 per ton in gold and silver. The ore is partly free milling, about 40 % of the gold being free. There are now about 100 tons of ore on the dump. It is the intention of the company to put in the necessary machinery this year, and prosecute the work with vigour.

"In the Fire Mountain camp, about 16 miles north-west of the head of Harrison Lake, a large number of claims have been recorded. A great many of these claims were staked before the snow left the ground last spring, and in some cases, I am informed, the stakes were planted in five or six feet of snow. The Fire Mountain and Fire Lake Gold Mining Companies have expended about $50,000 in connection with their properties in this region during the year. The companies have built wharves at the townsite of Tipella, at the head of Harrison Lake, and constructed a pack-trail from that point to the mining camp, about 16 miles. A saw-mill has been erected, having a capacity of 10,000 feet per day, and also a mill for the treatment of ore, having a capacity of 30 tons per day. The ore of Fire Mountain is generally free-milling. On the 'Money Spinner,' one of the claims of this group, there has been considerable development work done, and the company expresses itself very well satisfied with its prospects. A tunnel 175 feet in length has been cut on the vein, and a 75-foot shaft sunk. The vein is about 8 feet in thickness, and has been exposed for a distance of 1,000 feet. A trial shipment of 200 lbs. of ore from this mine, sent to San Francisco, gave $74.13 in gold per ton. There are now 1,500 tons of ore on the dump, and thousands of tons in sight. The mill has just been put in operation, and it is expected that this year will see a large output of the precious metal from this very promising camp. The Skookum Chuck Mining Company has also a group of six claims on Fire Mountain, adjoining the Fire Mountain Gold Mining Company's property. This company has done work amounting to about $1,000. The prospects are most encouraging, and the six claims have been bonded for $100,000.

"On Pitt Lake a large number of claims have been located, and on three of these (the 'Cromwell,' 'Champion,' and 'Rocket'), considerable development work has been done. On the Cromwell and Champion, owned by Messrs. Seymour and Clinton, between $4,000 and $5,000 have been spent. A tunnel 60 feet in length has been driven from the east side, and on the west side an adit of 100 feet has been driven to tap the lode. Both these cuttings are in the lode. These are copper propositions, showing gold and silver as well. Assays have given from $70 to $72 per ton. On the Rocket claim, owned by the Golden Ears Mining Co., the expenditure has amounted to about $3,000. There are two lodes on this claim which have been exposed for a distance of about 1,500 feet, showing a width of from 4 to 10 feet. These lodes are principally copper, with a percentage of gold and silver. Assays have been obtained from $40 to $500 to the ton. Three tons sent to Swansea realised about $45 to the ton. This is the actual cash value received by the company, and shows beyond question that the claim is a valuable property, if the lodes are of such extent as the appearances seem to indicate. The company expects to continue development work during the coming season.

"The 'Fat Man' and 'Nancy Jane' are the names of two claims situated on the line of the C. P. R., near Agassiz, which are making an excellent showing. Work has been done on the Fat Man to the value of about $3,000. A shaft 45 feet in length, and three adits, aggregating 210 feet, have been made. There are two lodes on this property parallel to each other, and about 150 feet apart, carrying gold, silver, copper, lead and zinc. These lodes, as far as exposed, show a width of from 5 to 17 feet, and assays as high as $65 to the ton have been obtained. This is essentially a copper proposition, and is likely to be developed extensively during the coming season.

"On Bowen Island, development work has been done on the mining properties of Mr. Fraser, to the value of about $7,000, and the indications are said to be most encouraging. On Jervis Inlet, Princess Royal Reach, and elsewhere on the coast, there are several properties which have made a good showing.

"There have been very few placer mines operated in this division during the year, and the results on such as have been operated are unknown. Several leases for dredging purposes have been taken out, and it is expected that dredging operations will be carried on quite extensively this year on the Fraser River, between Yale and Chilliwhack. A company has been formed for this purpose, and, I am informed, the necessary capital has been provided. If the appliances are such as to meet the circumstances, there is every reason to expect that considerable quantities of gold will be taken out of the river within the area mentioned.

"The mining operations of this division may be said to be quite promising. The total expenditure in development last year must have been at least $100,000, and the expenditure during the present year is likely to be considerably larger. It may be reasonably expected that three or four of the mines will become regular shippers before the close of the season, and this will encourage owners of other mining properties to prosecute development work with greater energy."

YALE DISTRICT.

GRAND FORKS—KETTLE RIVER DIVISION.

THE BOUNDARY CREEK REGION.

Boundary Creek.

This is the name now generally given to the large and important region extending from Fourth of July Creek to the main Kettle River as it flows from the north, embracing all the territory drained by Boundary Creek and its tributaries. Within this area veins and deposits of great promise and diversity in kind have been discovered, on which a fair amount of work is being done, but this district is in this peculiar condition in that the claim owners, seeing that the best and cheapest facilities for transport and treatment of ores are demanded, are waiting for these facilities to be supplied or definitely promised before undertaking very serious development work.

Two companies have charters to build a railroad through this district, but the holders have carefully studied the situation, and if the mining men will prove up the existence, under these extensive surface showings, of ore bodies that will promise a good tonnage for transport to the smelting centres or warrant the establishment of smelters here, the building of a railroad will be much expedited. Mining men should not hesitate in doing extensive and all-important prospecting, should not wait for the *next* man, as they can rest assured that they must lead the way, *i.e.*, prove up mines and deposits of pay ore and the railroads will quickly come. Realizing this fact to a certain extent more determined work is now being done, steam mine plants are or are about to be installed on several properties by men strong financially, and some of these large but, as yet, too low grade gold-copper deposits will be thoroughly prospected and the true significance of these surface indications wrought out

Besides the Boundary Creek Region in which, so far, the most discoveries have been made, is the Grand Forks Region, or the North Fork of the Kettle River and its tributaries, where many claims have been staked off, but in this Report the different camps visited will be described irrespective of their location in the two recording divisions.

LOCATION.

The former Kettle River Recording Division, in the Southern Yale District, extended west from the Trail Creek Division, or West Kootenay, along the International Boundary Line to the Osoyoos Division, thence north to the Vernon Division, embracing the valleys of Christina Lake, the North Fork of Kettle River, Boundary and Fourth of July Creeks, and the main Kettle River that leaves the Province at Midway to enter a few miles west of Grand Forks. All these waters finally merge in the Kettle River, which crosses the line south of Christina Lake and flows into the Columbia River at Marcus, in the State of Washington.

For greater convenience of recording, this Division was divided last summer into the Kettle River and Grand Forks Recording Divisions, with the Government offices at Midway in the former and Grand Forks in the latter.

TOPOGRAPHY.

This district has not the rugged, lofty, mountainous character seen in the Kootenays, at least the southern portion within the ken of the main body of prospectors, as none of the well-timbered, rounded mountains rise much above 5,000 feet, or 3,200 feet above Grand Forks. The trend of the valleys, as seen by the course of the various rivers, is north and south, and is dependent in some way upon the geological conditions, but there are low-lying connecting valleys or passes which, with the easy slopes, will greatly simplify the construction of a railroad that, to reach the chief points, will have to traverse a somewhat circuitous route.

Most of the country is well-timbered, but some slopes are quite treeless and covered with bunch grass, while most of the valley of the Kettle River is open and affords fine ranches when irrigated for all kinds of cereals and fruits, as the rainfall is small.

Roads and Trails.

Road building is not attended with any serious difficulties. The main Government road from Penticton, where connection is made with the C.P.R. by steamer "Aberdeen," after leaving Camp McKinney and following Rock Creek enters the Kettle River Valley at the mouth of Rock Creek and continues to Midway, beautifully situated in a wide valley, then up Boundary Creek, four miles to Boundary Falls and six miles to Anaconda, where the road turns to the east, while a road runs 1.5 miles north to Greenwood, the largest, most central and only incorporated town in Boundary Creek region. The enterprising founders of this town have built miles of road to the different surrounding camps, one of which, passing the hospital, traverses "Greenwood" and "Wellington" camps, and then joins the main Government road which enters the large and fruitful valley of Grand Forks, finely located at the junction of the North Fork and main Kettle Rivers. Thence the road runs to Marcus, or to Bossberg, on the Columbia, connecting with the Spokane N.R.R. to Rossland, Nelson, etc., on the north, or Spokane, etc., to the south.

Stages run two or three times a week from Penticton to Marcus or Bossberg *via* the towns mentioned, with the following scale of distances :—

Penticton to Camp McKinney	56 miles.
Camp McKinney to Midway	32 "
Midway to Greenwood	8 "
Greenwood to Grand Forks	23 "
Grand Forks to Marcus	45 "

Much of this road is good, but very dusty in dry weather, but much yet requires great improvement. It takes three days to travel from Penticton to Marcus, stopping over night at Camp McKinney and Grand Forks, after spending one night at Penticton.

Roads branch off at Rock Creek, Midway and Carson and cross into the United States, while roads are built from Greenwood and Grand Forks to the camps. Good pack trails run in many directions, and the prospector has easy access to much of this country.

Railroad charters are held by two companies; (*a*) by the Columbia and Western from Robson, on the Columbia, to Penticton; (*b*) the second charter recently bought by McKenzie and Mann, of Toronto, who are buying mining properties near Greenwood, is for a line from the Coast to Penticton, thence *via* Midway, Greenwood and Grand Forks to the Columbia River. During the coming year (1898) it is very probable that railroad construction through this district will see its commencement, following which a very great impulse will be given to mining work.

Geology

No geological survey of this region has yet been made, but Mr. S. S. Fowler, M.E., has given a very succint account in the Minister of Mines Report for 1896, as he had been over much of this ground during the two or three seasons he spent there studying the different mining camps. The writer, passing quickly from camp to camp, was able to form only a very general idea of the geological conditions, as all available time was devoted to the ore-deposits and their immediate environment.

However, the preponderant rock formation noticed from the North Fork of the main Kettle River was seen to be very highly metamorphosed, Archæan sedimentaries or gneisses, schists, quartzites, slates and perhaps some crystalline limestone, in which are found almost all the gold-bearing veins and veins of high grade silver-gold ore. Over-lying these rocks are seen the fragmentary areas of highly altered limestone, as this region has been subjected to much eruptive action along lines of fracture and eruption running northerly and southerly; and all the formations are traversed by dykes of various eruptives and overlain in part by areas of effusive rock, mostly light to dark green, partially crystalline, fine-grained, feldspathic rock, the miners "diorite," which is a very important member, as in this are all the large zones impregnated with gold, chalcopyrite, hæmatite and sometimes pyrrhotite and iron pyrites. Many of these deposits lie in contact with or close proximity to very crystalline limestones, which generally show a nearly perpendicular plane of contact with the general strike of north and south. Up the valley of Boundary Creek for about eight miles, or to Long Lake, flanked on either side runs a narrow belt of light-coloured hornblende granite in which has been found small veins of high grade silver-gold ore, as on the "San Bernard" claim. There are also large bosses of highly crystalline rock breaking up through the other formations, of syenite, diorite, etc., and dykes cutting every other formation are frequent. In Central Camp the greenish eruptive rocks have evidently been highly altered and rendered in places quite schistose.

East of Grand Forks, along the road, are schists, and up the North Fork are well bedded quartzites, and gneisses traversed by large masses of eruptive rock of various kinds. To the north of this district prospectors claim there is much granite, like that seen near Camp McKinney, and also the stratified Archæan rock.

Near Rock Creek is an area eight to ten miles long of sandstones and shales, probably of Cretaceous age, and here are found deposits of a fair grade of coal, on which practically little or no work has been done in exploration.

ORES AND ORE DEPOSITS.

Some have written of this region as being rich in copper ores, but as yet this is not proved, but there are certainly large zones carrying from 1 to 3 and 4 per cent. of copper, and some gold values. About all one can say at the present stage of very scanty development is that thoughout this region are (apart from the quartz veins and veins of high grade ore) large ledges or mineralized portions of the greenish, feldspathic rock, already described, from which good gold assays are obtained and which offer every inducement to extensive exploration. If more concentrated parts or regular ore-shutes are found, there is every reason to believe that such ore would prove to be very profitable as such good, but not pay, values are already got from a large amount of mineralized rock matter, and even some good pay ore has been found in the very limited work done.

It is impossible at the present time to give a definite or really satisfactory account of the ores and ore deposits of the Kettle River-Grand Forks District, as no producing mine has yet developed; no smelter or mill returns can be referred to, and much of the workings could not be seen as work had not been resumed and water had accumulated, but the prospects of this becoming an important mining district are excellent if we can judge from surface indications and the little work done. To attempt a classification of the different forms of veins or ore deposits is difficult, as throughout this region is found a great variety of ores, but perhaps one classification might be,

(A.)—Veins with quartz gangue and different minerals.

(B.)—Deposits or country rock, impregnated with copper, gold, and iron, etc.

Quartz Veins. These *quartz veins* are very varied and nearly every combination can be found, as—

(*a.*) Quartz with iron pyrites and zinc blende, with gold and silver, on the "No. 7," Central Camp.

(*b.*) Quartz with tetrahedrite, on the "Lincoln," Central Camp.

(*c.*) Quartz with chalcopyrite, pyrrhotite and gold, "Golden Crown," Wellington Camp.

(*d.*) Quartz with galena, zinc blende, and high silver values, as on the "Skylark," "Helen," "San Bernard," "D. D.," "Last Chance," etc.

(*e.*) Quartz with pyrrhotite and gold values, Long Lake Camp.

(*f.*) Quartz with iron pyrites and some gold, as the "Boundary Falls."

Nearly all of these veins are found in the highly altered sedimentary rocks and the eruptive granites, and, while mostly small, may become important when a railroad gives cheaper transport for ore.

Deposits. The large deposits or *mineralized zones* may be classed as follows:—

(*a.*) Greenish feldspathic rocks, impregnated with chalcopyrite, gold, traces of magnetite or hæmatite, and sometimes pyrrhotite, as "Mother Lode," "Stemwinder," "B. C.," "Volcanic," etc.

(*b.*) Large masses or deposits of magnetite, as on the "Knob Hill," "Oro Denero," "Emma," etc.

(*c.*) Country rock, impregnated with hæmatite, with some copper, gold and silver values, as "Gold Drop," "Snowshoe," "Big Copper," etc.

(*d.*) Bodies of very nearly solid pyrrhotite, that with as yet, very small gold silver values, as on Pass Creek, Christina Lake, etc.

The "surface showings" throughout this region are certainly very flattering, although it must be admitted that very little pay ore (*i.e.* under the best of considerations) has yet been found. The future of these camps rests greatly upon results of the development work, and at the time of going to press with this report, a much larger amount of underground work is being done or begun, with the assurance that if good bodies of pay ore are proved up, railroad and other facilities will soon follow, and that more abundant capital will flow in. Many mining districts in other countries languish because interest has never been aroused to their mining possibilities, but in British Columbia any part or region will now command instant attention if the miner by his work can show that he has discovered what may be made a mine.

Central Camp.

This camp presents a variety of ores; in that on the "No. 7," "Mabel," "Norfolk," "New York," "No. 9," etc., are gold or gold-silver-bearing quartz veins; on the "Cornucopia," pyrrhotite; on the "City of Paris," "Oro," "Golden Rod," "St. Maurice," "Lexington,' etc., auriferous copper sulphides, and on the "Lincoln," quartz with argentiferous grey copper.

Central Camp, locally known as White's, Douglas and Attwood's Camps, lies at an elevation of 4,000 to 4,500 feet along the very heavily timbered mountain spur, at the head of Douglas Creek, 8 miles by trail from Midway, and 5 miles from Boundary Falls. The formation consists of light coloured, greenish schistose rock, cut by dykes which appear to have nearly the same trend as that of the spur and of the schistose stratification, or about N.W. by S.E. A considerable amount of work was done, particularly in the years 1893-4, and with the exception of the "No. 7," and the operation of the French company, no work was being done at the time of visit (June), and with surface cuts caved and shafts filled with water, it was difficult to get as much information concerning these ore deposits as otherwise these openings might have afforded. However, as to assay values of the ore, very reliable data has been secured by the writer, and a description of some of the claims beginning at the N.W. end, or Attwood's Camp, is now appended.

Water for milling purposes, on a limited scale, may be sufficient in two small streams from 1,200 to 1,500 feet below the properties.

No. 7. Title Crown grant, 20.66 acres, purchased for $13,800 by the Boundary Mines Co., New York; superintendent, F. Keller. A strong vein, 1 to 4 feet wide, averaging 2 to 2½ feet, of bluish quartz, with considerable iron pyrites and zinc blende and a little galena dispersed mostly along the central portion of the vein, is exposed by cuts for nearly one thousand feet in the claim, with a strike N. 60° W. and dip N. 30° E. of 50° to 55°, being comformable with the enclosing schistose rocks, although a dyke of light-coloured fine-grained rock follows along as the hanging wall for most of the distance of the exposed vein, the underlying schists being so soft that all work is done there, leaving the clean quartz standing in the hanging.

An incline, or shaft No. 1, equipped with a horse whim, was down 140 feet along the vein, with, at 130 feet, 200 feet of drifting along a foot vein and a cross-cut southerly 200 feet running to intersect another quartz ledge showing on the surface. These workings were full of water. Two faults, at right angles to the vein and of 30 to 46 feet dislocation to N. when looking N.W., about 700 feet apart, have been found, and in shaft No. 2. 450 feet from No. 1, after sinking along the formation, then cross-cutting 30 feet to S.W., the vein has been found south of one of these breaks, and the shaft is being now sunk vertically to the vein. A general sample taken from the various cuts is stated to have given $35.50 in gold, while another sample of ore from shaft gave $3 in gold and 15.3 of silver per ton, which ore, when roughly concentrated by panning, 12½ to 1, then assayed $20 in gold and 82 ounces silver per ton of concentrates. The ore from this vein may be treated by stamping and concentrating, the concentrates being sent to smelters, but in the meanwhile the property is simply being carefully prospected.

A second ledge of pinkish-white quartz, with very little mineralization, lies about 100 feet S.W. of the main vein, and will be yet explored by the cross cut from No. 1 shaft. Assessment was being done by this company on six other contiguous locations, the "Lady of the Lake," "Glasgow," "McGregor," "Helen," "Fannie H."

Norfolk and *No. 9*, 1,500 x 1,500, owned by S. S. Fowler *et al.*, are located on the N.W. extension of the No. 7 vein, and on the former the vein is shown two to three feet wide by open cuts for nearly 600 feet, while it is thought to out-crop on the No. 9, but no work is yet done to demonstrate this.

New York, 600 x 1,500, owned by Jno. Douglas, is the N.W. extension of the ledge of white quartz on No. 7, and an 80-foot shaft has been sunk. Full of water.

Bob Roy and *Falcon*, located as the S.E. extension of No. 7, have had some work done on them, but these workings were not seen.

Mabel. Title, Crown grant, owned by Jno. Douglas, Midway; also the "Oro" and "Cornucopia"; lie south of the No. 7, or at Douglas' camp.

Mabel. There are three veins on this claim developed by shafts, but not traced out along their strike by further work. The first vein is small, 3 to 14 inches wide, down which is a small inclined shaft, 40 feet deep, showing the vein widest at the bottom, with quartz and well crystallized iron pyrites giving, it is stated, high gold values. Strike N. 60° W., dip N. 30° E. 60°. Vein No. 2 has a shaft, half full of water, about 35 feet deep, showing a vein 4 to 8 feet wide of parallel bands of white quartz and the green schistose country rock, the quartz carrying considerable zinc blende and iron pyrites, with a little chalcopyrite and pyrrhotite, 20 pounds of which ore tested by an examining engineer gave an assay value of $64 in gold, while a sample of barren looking quartz ran $6. This vein, strike N. 60° W., pitches steeply at first, probably influenced by the contiguous eruptive rock, then dips N. 30° E. at about 60°. Vein No. 3, near the south end of the claim, is small, with a shaft sunk about 40 feet on it, but close by is a much larger exposure of sulphide-bearing quartz which has not yet been prospected.

Oro. On this claim, S.E. of the "Mabel," is a wide band of heavy iron-stained schist, in which a shaft has been sunk about 30 feet, disclosing a body, limits or size unknown, of nearly solid copper sulphides and quartz, on either side of which the schist is impregnated with the same mineral, the ore giving assays up to 19 per cent. copper and $2 to $3 in gold.

Golden Rod. Area 600 x 1,500 feet, lying S.E. of the "Cornucopia," owned by Farrel and Midgeon, of the Parrot Smelting Co., Butte. On this claim is a very wide band of very light-coloured schistose rock, covered by a heavily iron-stained material or nearly typical "iron-cap," as shown by a number of open cuts, in which it is claimed a body of ore 16 feet wide is found, the ore being quartzose, impregnated with copper sulphides and giving good gold assays. A vertical shaft, 80 feet deep, with a cross-cut of 20 feet towards this deposit, is full of water, and no further work has been done since 1893, the principals awaiting the development of the district.

CITY OF PARIS AND LINCOLN.

Titles, Crown grants; each 600 x 1,500 feet; owned by Jno. Stevens, Fairview, H. White, Carson, Wash., *et al.*; located in White's Camp, about 3,000 feet south-east of the "Golden Rod."

City of Paris. Altitude, about 4,000 feet. Two shafts, 30 feet apart, No. 1 20 feet deep, No. 2 over 50 feet, now filled with water, are reported to disclose a shute of ore consisting of copper and iron pyrites, with some pyrrhotite and quartz, which was 6 to 16 feet wide with, in parts of this shute, several feet of solid mineral. Two general samples from the dumps taken by an examining engineer, who has kindly permitted the writer to benefit of his notes, gave :—(*a*) Gold, $13.50; copper, 6.4 per cent.; silica, 26 per cent.; iron, 31 per cent.: (*b*) Gold, $11.75; silver, 4.25 ounces; copper, 6.15 per cent.; silica, 31 per cent.; iron, 39.5 per cent. A sample from the centre or from the solid sulphides gave :—Gold, $27.13; copper, 5.7 per cent.; silica, 10 per cent.; iron, 37 per cent.

This ledge was not seen exposed in any other place, but it is thought to pass through the "Lincoln," where a cross-cut has been started from the shaft down on the "Lincoln" vein in its search.

Lincoln. On this claim extends for nearly 200 feet, with a strike N. 45° W., and dip N.E. of 70°, a large outcrop of white quartz, copper-stained, lying apparently, after a hurried examination, conformable with the enclosing schists, and forming an ore unique in this camp by reason of the quartz carrying tetrahedrite or grey copper, which, it is claimed, gives way in part to chalcopyrite in depth. On the surface this vein shows a width of 4 to 8 feet of quartz, which in places is heavily mineralized, much resembling the ore of the "Best" mine in the Slocan, and into this has been run an open cut and drift, mostly along the hanging-wall. In this cut the vein contains a "horse" of schist rock, and a shaft has been sunk along in the hanging-wall 70 feet (now in water), while a cross-cut, north-easterly, for 100 feet was driven to prospect for the "City of Paris" ledge, thought to pass through in close proximity. The quartz vein is 5 feet thick at the bottom of this shaft.

While some little work has been done, this vein has in reality been but slightly prospected, and as to the values of the ore, some assays of samples taken by the above-mentioned engineer may be of interest.

(*a.*) General sample from dump of quartz showing only a small amount of mineral—gold $5; silver, 27.3 ozs.

(*b.*) General sample from dump at a 20-foot shaft—gold, $3; silver, 38.5 ozs.

(*c.*) Quartz from bottom of 70-foot shaft, containing some copper pyrites and grey copper,—gold, $3; silver, 22.5 ozs.

This one, if further development proves satisfactory, the depth of wash having so far prevented its further exploration on the strike, will be essentially amenable to concentration, and at the present time both these claims are under bond.

A trial shipment of three tons of sorted ore sent to the smelter in Omaha is reported by Mr. White to have yielded $26 in gold, 212 ozs. silver, and 15 % copper per ton.

ST. MAURICE MINING SOCIETY, FRANCE.

This company, M. Ch. Gill, manager, having secured the control of several claims just north of the international line, such as the "St. Maurice," "St. Lawrence," "Jack of Spades," etc., is engaged driving in cross-cut tunnels to intercept a ledge of auriferous copper ore found in the Washington mine immediately across the line, which is believed to pass through some of the claims owned by the company. On the Jack of Spades is said to be a ledge of gold-bearing copper ore, on which several assessments have been done.

OTHER CLAIMS.

Other locations have been made in this camp on which both quartz veins and copper-bearing ledges have been found, but, as yet, these are only slightly developed; but on the advent of a railroad, with the consequent much more favourable facilities, this camp will receive much greater attention; the relation of these deposits to one another will be studied and traced out, and those properties now showing up so favourably with the, as yet, meagre amount of work, will receive the much greater attention they certainly merit.

DEADWOOD CAMP.

In this camp, from three to four miles north-west of Greenwood City, the *Mother Lode*, *Sunset*, *Green*, and *Morrison* were visited, and work was found in progress on the "Mother Lode" and "Sunset," from which the waggon road from Greenwood City and Anaconda lies about one-half mile distant.

Mother Lode. Mr. Frederic Keffer, on behalf of the Boundary Mines Co., New York, is conducting the development and exploration of this claim, which (elevation, 3,300 feet) is 600 x 1,500 feet in area and surveyed for Crown grant. A tunnel had been driven easterly 245 feet through 42 feet of the crystalline limestone, and for the remainder of the distance through fine-grained, greenish, eruptive rock impregnated with a small percentage of chalcopyrite, some iron pyrites, and, in parts, very fine-grained magnetite and, probably secondary minerals, calcite and quartz.

The tunnel terminates at a fault (?) plane, along which is the soft gangue, and beyond which the rock has not been broken, as this is thought to be the limit of this copper-bearing zone that, 170 feet wide, lies between the limestone on the west and fine-grained, massive rock on the east, and trends north and south. Throughout this zone, the sulphides are not segregated into solid masses so far as yet developed, nor are they concentrated more in one part than in another, as near the enclosing rocks, but at one point, 90 feet from the face of the tunnel, an incline was being sunk (20 feet June 20th) on a dip of 60° E., the supposed dip of the zone or ledge, in which the rock excavated was carrying a fair amount of the copper sulphides, while in depth further work may be done in the search for concentrated ore bodies or shutes.

Careful and systematic sampling is followed, and while this copper-bearing material will carry from 2 to 3½ % copper, gold-values are constantly found, but the values were not ascertained; but if ore bodies are found carrying a larger percentage of sulphides, wet concentration may be found to be advantageous, although this material, if enough gold is present for profit, will be well adapted for furnace work, as analysis of the ore now gives SiO_2 35-40 %, FeO 15 %, CaO and MgO 20-25 %, Al_2O_3 up to 12 %. (Mr. Keffer's analysis.)

On the surface, the mineral-bearing zone is much decomposed and copper-stained, the wash being of a deep, red-brown colour, while much of the surface rock is converted into gossan. In one opening, the vertical plane of contact with the lime was well shown where the copper-bearing rock, here quartzose, lay tightly against the marbleized lime, and in other holes, along what is called the hanging wall, this decomposed ledge matter stops abruptly. A millsite has been secured two-fifths of a mile distant, where is a fair but adequate supply of water for concentration, but, in the meanwhile, this body of copper-gold-bearing material will be vigorously prospected. Seven men at work. Since last June, another drift across this zone has been driven from the bottom of the incline 90 feet, and much better gold values are being got, which lead to greater expectations of striking pay ore.

Sunset. The *Sunset* and *Crown Silver*, lying east of the "Mother Lode," and since sold to W. L. Hogg, of Montreal, were being prospected. The *Sunset* claim extends over a small but steep knoll of diabasic rock containing magnetite and some copper pyrites, which have, on decomposition, converted the surface rock into what the miners term "iron-capping," the blue and green copper stain on which is very prominent for some distance.

Several shallow shafts and cuts have been made on this knoll in which more or less auriferous chalcopyrite is seen irregularly scattered through the rock mass, and now a tunnel is being driven north 75 feet (June 20th), in which some iron pyrites and a very little copper sulphides carrying some gold are found, but it is yet too early to determine the trend and boundaries of this mineralized rock or to form any estimate as to values; further underground development must be awaited.

On the *Crown Silver* some prospecting has been done in much the same material as on the "Sunset." Three men at work.

Morrison.—On this claim, 600 by 1,500 feet, owned by Morrison *et al.*, near by the road to the Copper Camp, are a shaft and open cut on a ledge, consisting of massive iron pyrites with some pyrrhotite and chalcopyrite, of which two or three tons lay on the dump by the shaft, which was flooded. In the cut lying next to crystalline limestone were two feet of these sulphides, while 100 feet distant a shaft had been sunk 15 feet in another but small exposure of the same kind of ore, which is stated to carry good gold values.

Gem.—Fifteen hundred feet by fifteen hundred feet, John Dunn *et al.*, one-half mile south from the *Mother Lode.* A small open cut had been made in a light coloured, quartzitic rock, where there were two to three feet of very decomposed, red iron-stained quartzose rock and iron pyrites, dipping S. 45°, that carries some gold.

COPPER CAMP.

A road about six miles long runs west from Greenwood or Anaconda to this camp, which was at one time the scene of considerable work, although very little was done during the past year. The large exposure on the "Big Copper" attracted much attention, and claims have been staked off for miles along the supposed trend of this lead.

Big Copper. Elevation about 4,400 feet. Along a narrow area of crystalline limestone is a zone of porphyrite very highly mineralized with hæmatite, which also occurs in solid masses and at the contact with the lime stringers, and sheets of this ore ramify through the limestone. Much of the porphyrite has been shattered, forming a breccia with a hæmatite cement, but this body at its widest is over 100 feet wide, and in the iron some of the higher copper compounds, such as chalcocite, cuprite, and even metallic copper near the surface, have been found, but so far as work has proceeded this has proved to be a body of iron ore carrying very small values in gold and copper.

This is certainly a very interesting deposit, one that should be prospected much further despite the fact that the work already done has not disclosed pay ore. No work was being done in June. Timber plentiful.

Last Chance. This claim, south-west of the above location, and on the south side of a dividing belt of limestone very highly crystalline by contact with the eruptive rock, is a grey, coarsely porphyritic rock, brecciated with a cementing mass of hæmatite near line of contact. Some open work has been done here, but no traces of mineral other than the iron were seen.

Enterprise. Lying north-east from the "Big Copper" considerable work had been done at one time in a shaft sunk by J. E. Boss, but no ore was seen on the surface or dumps, only iron-stained brecciated porphyrite that turns quite black on exposure. No work done for several years; title, Crown grant; area, 15.75 acres.

King Solomon. Title, Crown grant; area, 20.6 acres; owned by Mr. Corbin, of the Spokane N. R. R.; lies south-east of the "Big Copper." Here is a 30-foot shaft, where lying next to the marbleized limestone the erputive rock is somewhat mineralized and traversed by irregular stringers of hæmatite in which have been found some chalcocite and native copper. No work has been done for several years on this claim, or on the *Copper Queen*; title, Crown grant; area, 19.25 acres; also owned by Mr. Corbin. Assessment work has been done on many other claims in this locality, but nothing definitely has been discovered upon which to base a report.

Smith's Camp.

The Old Republican Mining Co.

This Company, W. T. Smith, Greenwood, President, owns three Crown-granted claims, located on the hills west of Boundary Creek, near Anaconda.

Non-such. Elevation 2,700 feet. In the quartzose schists and slates, two tunnels have been driven to explore an irregular vein of white quartz, carrying a little iron and copper pyrites, on the trend of which 800 feet to the north west rises the eruptive mass of granite that runs up this valley. The upper tunnel, 100 feet long, shows a vein 1.5 to 4 feet wide, but the lower, 240 feet long, with a 60-foot cross-cut, was along the vein at the beginning, but shows nothing but stringers of quartz in the schists for most of its distance.

Last Chance. On the timberless slopes is an irregular vein from 1 to 30 inches wide, of white, banded quartz with galena, gold, and native silver, and coarse crystalline iron pyrites. This vein is nearly conformable with the enclosing black slates, and is more or less contorted and irregular, as seen in the incline 95 feet deep being sunk on this vein on a dip of 35 to 50 degrees. Several tons of fine looking ore, showing the native silver, were on the dump, and the vein can be traced in several open cuts. Two men were at work.

Republic. On the face of the bluff, over-looking Boundary Creek, is a vein with the same strike as the "Last Chance" vein, but cutting across the slates, 12 inches wide, an incline full of water, was down 50 feet, on what was said to be a very uniform vein, and on the dump were 2 or 3 tons of ore, or quartz with much galena, iron pyrites and some blende and copper pyrites, an average sample of which was stated to have assayed 3 ozs. gold and 18 ozs. silver. There is an excellent tunnel site here.

Golconda. Situated by trail, about 2.5 miles west from Anaconda, are the *Golconda*, *York*, *Cleveland*, *Laocoon* and *Wild Rose*, owned by Hon. Geo. E. Foster, *et al.*, and under the charge of J. C. Haas, M.E.

On the *Golconda*, along the heavily timbered, steep mountain side, a shaft was being sunk (50 feet) where along a smooth fissure plane in the fine-grained greenish rock, the rock at the surface consisted of decomposed material and iron oxides, which, in depth became very fine-grained sulphides, with traces of copper pyrites, with some gold and silver values. This ledge has been traced for 300 feet by open cuts.

Iva Lanore. Lying one mile north of "Golconda," owned by the B. C. Gold Fields Exploration, Development and Pro. Co. An incline had been down 32 feet, down on a small ledge carrying some copper pyrites, samples from which assaying 4 to 5 per cent. copper, also assayed $12 to $14 in gold.

Boundary Falls. This claim, about 1,200 yards by waggon road from Boundary Falls, and owned by the Boundary Falls G. M. Co., Vancouver, has a quartz ledge, dip north-west 75, in which the white quartz with coarse iron pyrites is from a few inches to 2 and 5 feet wide where the vein is traceable for about 200 feet. A shaft, 4 by 10 feet, and 40 feet deep, was being sunk, in which the vein was seen to be much split up with stringers running into the country rock, and with no parting or selvage between the gangue and country rock. Several years before, the rotten surface ore was treated in a small two-stamp mill set up at the Falls, but the ore becoming base this mill was then useless. Some samples of this ore give high gold assays, but no average values could be ascertained.

Tunnel Claim.—To the north of the above claim, a tunnel had been driven in 40 feet along a quartz vein, 18 to 24 inches wide of quartz, some iron pyrites and copper pyrites.

Providence Camp.

This camp embraces those claims lying on either side of Boundary Creek at the town of Greenwood. Here in the band of hornblendic granite and adjacent highly metamorphosed sedimentary rocks, are found small veins of high grade silver ores with good gold values simi lar to the ore described on the "Helen" claim. These veins may yet prove very valuable as work proceeds and cheap transport is provided, but all work was suspended except that being done by the Boundary Creek M. & M. Co., on the west side of the creek.

San Bernard. East of the townsite of Greenwood, owned by C. S. Galloway. Here is a vein, strike north 20° east, dip easterly 65 to 80° in the granite and traceable for several hundred feet. The vein is 1 to 6 inches wide of quartz carrying argentite, native silver, galena, copper pyrites and zinc blende, the quartz being coarsely crystalline and with comby structure. A shaft had been sunk 65 feet to where a flat dipping fault had intervened below which work had not been done to find the vein. On the dump were sacked about 3 tons of ore that were stated to carry from 150 to 180 ozs. silver and $20 to $30 in gold per ton. No work was being done. Mr. Galloway also owns an adjacent claim, the "New Alaska," on which is a small, barren quartz vein.

Providence. This claim lies north of the above, but was not visited as nothing had been done since 1895, but from a vein, about 12 inches wide, running east and west, about 40 tons of carefully sorted ore were shipped out in 1893, the value of which is said to have been 300 ounces of silver and $80 in gold per ton. Area, 51.3 acres; title, Crown grant; owned by the Spokane Northern Mining Co.

BOUNDARY CREEK M. & M. CO.

This company owns ten claims on the hills west of Greenwood, and several were being developed. Capital stock, $1,500,000 in $1 shares.

D.A.—Here is another small vein, 1 to 6 inches wide, of high grade silver ore or quartz with galena, native silver, copper pyrites and zinc blende, assaying over 200 ounces silver and $10 in gold per ton. There was an open cut 50 feet long on the vein, and an incline of 30 feet to the tunnel being driven in the gneissic country rock. The vein had been followed for 30 feet, where it was 4 to 5 inches wide but, having been faulted, a cross-cut was being driven to find its continuation. A shipment of 4.3 tons in 1894 to smelter, of sorted ore, gave 74.7 ounces silver and 5 ounces gold per ton.

G.A.R.—A shaft 6x10 feet had been sunk 35 feet where a small vein showed on the surface but disappeared, until in the bottom there were about 2 feet of quartz with traces of native silver, ruby silver and blende. Work was to be continued here. The country rock is a greenish, gneissic formation.

O.B.—In the shattered granite along an apparent shear zone, a shaft was being sunk on a small vein, 6 to 10 inches wide, of white quartz, containing a little iron pyrites, but since time of visit, it is reported that some copper pyrites and galena had appeared with some gold and silver values.

No work was seen elsewhere, but other small veins are known to exist, and one large ledge of white quartz, all of which are yet to be tested. Good cabins. Seven men at work. All work has since been stopped on these properties.

Anaconda Group. This group of four claims lying north of the above company's property and west of Boundary Creek were bonded by E. A. Beilenberg to an English syndicate, represented by Alfred Woodhouse. A wide zone running north and south of very quartzose rock, heavily iron-stained and carrying, in places, irregular bunches of iron and copper pyrites, was being prospected by shallow cuts and strippings.

Higher up the hill were said to be exposures of solid sulphides or iron pyrites with copper pyrites and small gold values. Very little could be said of this zone until much-needed exploratory work was done, which Mr. Woodhouse had promised would be done on a liberal scale.

Elkhorn. Lying south of the "G. A. R."; area, 1,500 x 1,500 feet; owned by C. L. Thormet *et al.* A tunnel had been driven 40 feet along another of these small veins, 12 to 18 inches wide, of quartz carrying a little gold, native silver, galena, and zinc blende. No work was being done.

LONG LAKE CAMP.

This camp, embracing the claims located on either side of Long Lake, about seven miles north of Greenwood, by waggon road built during the past season to the *Jewel* claim, presents conditions quite different from any yet described, by reason of the gold-bearing veins of quartz and sulphides in the micaceous schists, quartzites, and eruptive granite. The mountains are lofty, with steep slopes from the lake, some of the claims lying 2,000 to 3,000 feet above the lake, out of which flows Granite Creek ; but, with the exception of the "Jewel" claim, little work other than assessment was being done. These veins are irregular in size, of milky white quartz, carrying some pyrrhotite, galena, copper pyrites, and on some claims tellurides, first recognized by Messrs. H. A. and G. A. Guess, Greenwood, and since analyzed by Dr. G. C. Hoffman, Geological Survey, p. 10. R. Annual Report, Vol. VIII. On the *Lakeview* claim both altaite, or telluride of lead, and hessite, or telluride of silver, were detected by Messrs. Guess, while petzite, containing 18.79 per cent. gold, was found on the *Enterprise*.

Much of the timber is now gone from many of these claims, but on the lower lying ones there is ample for mining purposes. Good and abundant water power is in Granite Creek, and mountain roads can be built to any property,

Jewel. The *Jewel* and *Denero Grande*, title, Crown grants applied for, lie 2,500 feet from the south end of Long Lake and seven miles by road from Greenwood, at an elevation of about 3,900 feet above sea level.

This property, under the charge of Mr. Leslie Hill, and equipped with a suitable plant, was being vigorously prospected, there being a 6 h.p. hoisting engine and 15 h.p. boiler (Jenckes Machine Co.) and steam pump. Near the dividing line of the two claims was found a large body of barren-looking white quartz, carrying in spots coarse iron pyrites and galena, in which an 8-foot hole was sunk, all in ore that carries low gold values, but a little to the south, on the *Denero Grande*, a shaft was sunk 19 feet, 7 feet being all in the vein, carrying much copper pyrites and high gold values.

About 75 feet north, on the "Jewel" claim, a well-timbered, two-compartment shaft was sunk 130 feet on the vein that has a trend north and south and a dip east of about 40 degrees, and at 120 feet drifts had been run north 90 feet and south 130 feet. The shaft was begun in an ore-shute, 8 feet wide, of high-grade gold and silver quartz, with coarse iron pyrites, galena, traces of copper pyrites and tellurides. This shute continued for 35 feet, with a width of 4 to 8 feet, excepting for 15 feet, which were 1 to 2 feet wide. Below this is a large body of barren white quartz, 4 to 6 feet wide, but with a 10-inch pay streak at the drift. This quartz continues in the drift north 2 to 5 feet wide. South the vein was 1 to 4 feet wide, with a 12-inch pay streak, and crossed by two narrow dykes that apparently had not dislocated the vein to any extent. This vein is here in a greenish hornblende granite, and at the surface to the north runs for 200 feet until cut off by a large porphyry dyke, beyond which is a large exposure of barren-looking quartz not yet traced out, although 250 feet east is a vein (discovery post here) not traced to the south but for several claims to the north.

Assays by the Guess Bros., of samples from the rich streak ran from $401 to $523 in gold and from 106 to 141.5 ounces in silver per ton. The shaft is now being sunk 150 feet deeper, when further drifting will be done.

Enterprise. Owned by the Greenwood Gold M. Co.; lies north of the "Jewel," which vein continues north, out-cropping at several points. On the fractional claim *Enterprise* is a 20-foot shaft and an open cut, where the vein is 2 feet wide, of milky-white quartz, somewhat honeycombed and carrying a little galena and iron pyrites, while on the *Anchor* are two shallow holes showing an irregular, broken quartz vein 1 to 3 feet wide, considerably mineralized with galena and iron pyrites. Timber plentiful. No work being done.

Ethiopia. North of "Anchor"; owned by Canadian Gold Fields Co. In the slaty schists are two veins traced out only for short distances, the upper one of which is a vein of barren white quartz, running N. 40° E., while the other, lower down the hill on the regular north and south trend, shows in some small cuts a vein 12 to 20 inches wide of quartz heavily mineralized with iron pyrites and galena. A large porphyry dyke lies close by. No work being done.

It was reported that quartz veins had been traced still further north, but these claims were not visited, as little or no work had been done.

Gold Drop. A quartz vein, about 1,500 feet east of and nearly parallel to the "Jewel" vein, out-crops on several claims, at least these out-crops are thought to be along the same vein.

The "Gold Drop," owned by L. Bosshart and F. Dittmer, area 1,500 x 1,500 feet, has an exposure or "blow-out," 20 feet wide, of white quartz carrying very little sulphides. Some very fine samples of free gold were found near the surface, where a shaft was sunk 22 feet, the vein narrowing down to 10 to 20 inches. Two hundred feet away another small shaft was sunk, where a little quartz was showing, and assessment work was being done to trace out a small vein running east and west. This claim, staked off in 1895, is the oldest in this camp.

North Star. This claim and the "Cairngorm," fractions, lying north of the "Gold Drop," were bonded to Leslie Hill, M. E., for $12,500. At an elevation of about 4,600 feet above sea-level. In shaft No. 1, 60 feet deep, is seen a vein 2 to 3.5 feet wide, dipping east 60° in the schists, of white quartz with a streak of galena and iron pyrites along the smooth hanging wall. Shaft No. 2, 40 feet south, was down 20 feet, to where is a body of the white quartz 1 to 8 feet wide, lying much flatter. On the surface near by, the vein is 4 to 5 feet wide, of reddish white coarsely crystalline quartz, with some sulphides. Good gold assays had been obtained from this vein, and Mr. Hill then contemplated giving this property further testing, with results not known to the writer.

Golden Eagle. Lying north of "Cairngorm," a small quartz vein showed in a 10-foot hole. Owned by R. Wood *et al.* Here the rocks are seen to be highly metamorphosed sedimentaries or schists and gneisses, with a strike east and west, across that of the veins.

Many other locations have been made on these hills, but the above are the chief ones with any work done.

OTHER CLAIMS.

The following claims were not visited by the writer, but the following information was gleaned from very reliable sources :—

Roderick Dhu.—About 1,000 feet above and one mile west of the lake, and two miles by trail northerly from the "Jewel," owned by Messrs. R. Wood, J. B. Jones *et al.*

(*a.*) *Vein No. 1*, 2 to 14 inches wide, not traced far, of quartz with galena, iron pyrites and tellurides, has a 50 foot shaft, from which, at 10 feet, Mr. J. C. Haas took a sample that assayed $80 in gold, and $20 in silver, while an average sample by Mr. Guess, gave $100 per ton.

(*b.*) *Vein No. 2*, of barren-looking white quartz 4 to 6 feet wide can be traced throughout the length of the claim, but little or no work has yet been done to explore it.

Lake View.—Owned by C. L. Thommet, R. and H. Wood, Greenwood, lies about 2,000 feet north-east of the "Roderick Dhu." A 100-foot tunnel starts in on a vein of white quartz that carries a good percentage of galena, pyrrhotite, iron and copper pyrites, and the tellurides mentioned above. The vein varies greatly in width from nothing to 3 and 5 feet, and very little is showing at present in the face. A shaft has been sunk 35 feet near the tunnel mouth, exposing a vein 18 inches wide of quartz, with a great deal of pyrrhotite, which is stated to give high assay values in gold and silver. The vein has not been traced on the surface any distance.

Amanda.—Owned by Chas. Collier *et al.*, lies 1,500 feet south-west of the "Roderick Dhu." At the south end of the claim is a vein 15 to 18 inches wide, of quartz with galena, blende and pyrites out-cropping at one place, while at the north end is another out-crop 4 feet wide, of barren-looking quartz, and small shafts have been sunk on each of these exposures.

Alice, north of "Amanda" claim, owned by Sir Charles Ross, Nelson, has a vein traced for 200 feet, 12 to 18 inches wide, of quartz with galena and pyrites, and also pyrrhotite, which, according to assays made by Mr. H. Guess, always runs high in gold and silver. Small shaft.

Electra.—Owned by R. Wood *et al.*, has a vein four to ten inches wide of quartz, with galena, pyrites, etc., assaying well in gold. Two assessments done.

C. O. D.—Owned by Chas. Colliers *et. al.*; quartz vein, two feet wide; one mile west of "Rhoderick Dhu." Quartz carries some gold values.

Agnes.—Lies south, but separated by the fractional claim the "Lady of the Lake" from the "Roderick Dhu." Here is a quartz vein carrying very little sulphides, but traces of silver telluride (?) reported to be traceable by different out-crops through this and the two claims just mentioned, and to be lying between much twisted schist and quartzite. Little or no work done.

SKYLARK CAMP.

This camp lies two miles east of Greenwood, between the Wood's and Greenwood Roads, on a road connecting these two. Here has been found ore quite different from any found in this district, but little work has been done except on the "Skylark." Timber is plentiful, and roads can be easily constructed to any claim.

Skylark.

This claim, area 900 by 1,500 feet, and the *Denver*, 600 by 1,500 feet, are owned by G. Lavaguino, Colorado; manager, Chas. E. Rueger, Greenwood. This property was bought for $15,000. At time of visit (June 27th) the means of hoisting water had given away and water was in the workings, but a small vein runs north and south, and dips east 15 degrees, is a greenish, light coloured massive rock somewhat stratified. An incline, equipped with horse-whim for 80 feet, followed the vein, which was 1 to 12 inches wide of nearly solid mispickel, carrying some fine grained galena and zinc blende and high silver values, although parts of the vein carried nearly clean galena that assayed the highest in silver. At the bottom of this incline the vein was faulted, and a cross-cut had been driven 110 feet, and also 2-300 feet of drifts, but no ore was, it was stated, in sight. On the dump were about 15 tons of first-class ore which, sampled and assayed by Mr. Rueger, gave 250 ounces silver and 1 ounce gold per ton; also several tons of poorer ore running 50 to 60 ounces in silver. This autumn all work has been stopped on these claims.

The *Denver*, lying to the north, shows in several open cuts a small quartz vein, assaying 25 to 30 ozs. in silver, but this vein dips to the west, and up to time of visit had not developed any size or values.

The *Silver King*, 1,500 by 1,500, lying west of the *Denver*, owned by John Douglas, Midway *et al.*, has a small vein of quartz with a little mispickel, galena and blende, traceable by means of small open cuts for 200 feet through a heavily iron-stained, fine-grained but somewhat stratified rock, but no real work has been done here yet to prospect this showing. This veins also runs north and south, and dips east 60°, and is said to carry small silver values.

The *Last Chance*, traversed by Wood's road, lies one mile north from the "Skylark," and was owned by Geo. Cook, *et al.* Work was suspended, but a shaft had been sunk on a very small vein of quartz carrying a little mispickel and galena, that dips easterly at an angle of 45°, but flattens to 20°. Some gold and silver is in this ore, and work was to be resumed.

Helen.

Area, 920 x 1,500, title Crown grant applied for, located near road and half a mile south of Greenwood, owned by the Boundary-Helen Gold Mining Company; capital stock, $300,000; Secretary, G. T. Hodgson.

In gneiss and quartzite, in close proximity to granite, is a vein, strike north and south, dip E. 60°, 6 to 16 inches wide of gold-bearing quartz, with galena and blende. This vein can be traced for over 1,000 feet, and cuts across the stratified formations and also apparently through the granite. An opening 29 feet long and 25 feet deep shows this small, but well mineralized vein under a smooth hanging wall, with at one place a streak 4 inches wide where the vein was 8 inches in width, that gave an assay of 7.6 ozs. of gold, 64.6 ozs. of silver, and 33 % lead, while 10 tons of sorted ore sent to the smelter on January 24th, 1895, returned $36 per ton, or, gold 1.45 ozs., silver 28.8 ozs., lead 8.9 %. These returns were submitted by Mr. Hodgson. No work was being done, but on further development, if a milling process should be deemed requisite, there is ample water supply close at hand.

Other Claims—Several other claims were visited, such as the *Nightingale*, on which Wm. Christie had done, unaided, considerable work, but with no encouraging results, although he deserves success for his indefatigable endeavours to prove up his property.

Greenwood Camp.

The group of claims, spoken of as the "Greenwood Camp," lies on the summit of the watershed (elevation 4,700) between Boundary and Fourth of July Creeks, six miles east of Greenwood, and all of the chief claims lie near Wood's road, from Greenwood to Grand Forks. As the dividing line passes along this summit, such claims as the *Snowshoe*, *Gold Drop*, *Monarch*, *Rawhide*, etc., are in the Grand Forks division, the *Stemwinder*, *Brooklyn*, *Old Ironsides*, *Knob Hill*, *Idaho*, *Gray Eagle*, *War Eagle*, *Missing Link*, etc., in the Kettle River division.

Nearly all these mountains, well rounded and low-lying, are heavily timbered. If a large mining camp is yet developed here, it will not be difficult to run a railroad to a convenient point, and such will be necessary (if these ores are to be concentrated) to transport cheaply the ore to the water supply, two or three miles distant.

Ores—The ore of this camp is essentially, as yet, a low grade gold bearing yellow copper, disseminated with hæmatite and some calcite through altered greenish fine-grained eruptive rock, but massive magnetite iron ore bodies have been found along the apparent trend of leads in which is the copper ore. Since the time of visit (June), several of these claims have passed into strong hands, and this winter these large mineralized out-crops are being more thoroughly tested to see if ore-bodies here exist more concentrated and containing higher values. If such are found, this ore should be well adapted for smelting, and interesting problems in concentrating may yet present themselves as this very interesting camp is carefully explored.

Stemwinder. This claim was purchased in 1894 by Farrel & Midgeon, of Butte, for $15,000, but recently sold to McKenzie & Mann, Toronto. Area, 20.6 acres, title Crown grant. Strike of lead, north and south; dip, east 70°. At this property work had been suspended, and water was in the lower workings that are close to the main road, and, locally, this is thought to be one of the most important claims in this camp, but little could be learned except from what was to be seen on the surface. The ore consists of gold, yellow copper pyrites, and hæmatite in greenish feldspathic eruptive rock, the copper in the ore on the dump running from 3 to 5 %, while good gold assays are obtained.

This ledge is thought to be the continuation of that on the "Old Ironsides" claim. The work done consisted of (*a*) a 60-foot shaft equipped with a horse-whim, a cross-cut with incline 30 feet deep, exposing some ore; (*b*) a 60-foot cross-cut tunnel to tap these workings, but not in far enough; (*c*) a 30-foot shaft 40 feet west of (*a*), in which was some low-grade copper ore; (*d*) a 40-foot shaft (full of water) 300 feet north of (*a*) is said to have followed ore to this depth, while ore was in (*e*), another shaft 40 feet distant, about 80 feet deep. Nothing more definite can be said of this property, but on the dump was seen a pile of ore that would run from 3 to 5 per cent. in copper, with gold assay values said to run from $12 to $134, but much more development work is yet needed before it can be known what this mineralization by gold and copper may lead to in depth.

The above owners are also interested in the *Montezuma*, that lies north of the Stemwinder, and in the fractional claim to the south, the *Phœnix*, which lies between the Stemwinder and Old Ironsides. This winter, Mr. J. E. Boss has begun the more thorough exploration of these properties.

Old Ironsides. On this claim, title, Crown grant; area, 20.18 acres, lying south of "Stemwinder" and "Phœnix," is a lead running north and south, from which, in a 75-foot shaft (full of water) some ore has been taken or magnetite, hæmatite, copper and iron pyrites. Some shallow holes are apparent in the same ledges, but near the south end of the claim. Since time of visit, prospecting has been resumed. Timber good and abundant.

Knob-Hill. Lying immediately south of the "Old Ironsides," on this claim, title, Crown grant; area, 600 by 1,500, this north and south ledge shows a large body of magnetite iron ore, in which is an open cross-cut nearly 100 feet long, and 3 to 10 feet deep. The ore-body is here fully 50 feet wide, of nearly solid, fine-grained magnetite, carrying a very small percentage of copper and some quartz and calcite in the same altered eruptive rock. Narrow bands of quartzose rock, with some yellow copper, traverse this body of iron along the line of strike. Small openings show the continuation of this mineralized zone to the south, but with a much narrower width of ore.

Again we are confronted by the fact that too little has yet been done to show the true significance of this large ore-body, in which are, apart from iron ore, very small values in gold and copper, as will be seen in the samples taken and assayed by Mr. Guess, whose results were kindly submitted by Mr. Graves, *i. e.*:—

(1.) Nine feet of magnetite ore gave $2.75 in gold, 9 ozs. silver per ton, 3.8 % copper, 57.6 % iron, and 7.5 % silica.

(2.) Twelve feet gave $1.12 in gold, .6 ozs. silver per ton, 1.9 % copper, 46 % iron, and 22.3 % silica.

(3.) Twenty feet gave $1.50 in gold, 4 ozs. silver per ton, 1.82 % copper, 36.9 % iron, and 29.3 % silica.

A general sample across the whole ledge gave (not assaying for gold or silver) 37.8 % iron, 30.8 % silica, and 6.3 % lime.

Hence this ore exhibited in this surface cut will make valuable material for fluxing in smelting, and further work, since resumed, may yet disclose higher values in gold, silver, and copper in this ledge, about which so little is really known.

Good timber plentiful; claim three-fourths of a mile from the road, and owned by the Knob-Hill Gold Mining Co.; capital stock, $1,500,000; president, F. P. Bucke, Sherbrooke, Que.; general manager, J. P. Graves, Spokane, Wash.

FAULTED END OF THE "CARIBOO" VEIN

STAMP MILL, "CARIBOO" MINE, CAMP McKINNEY.

Gray Eagle, south of "Knob-Hill,' owned by J. Stevens, Fairview *et al.* In an open cut 20 feet long, 4 to 8 feet deep, was seen the same eruptive rock, impregnated with hæmatite and copper and iron pyrites, but no solid sulphides were in sight. Near the end line of "Knob Hill," were two shallow shafts in very much decomposed iron-stained rock.

Idaho, west of the "Phœnix" and "Old Ironsides," owned by Geo. Ramberger, D. McLaren, Greenwood, *et al.* Here a band of rusty, broken rock with hæmatite, yellow copper, a little quartz and calcite occurs along a line of fracture running north and south, and dipping east 45°. A shaft 27 feet deep (in water) disclosed some ore that gave values in gold and copper, but more work is much needed. Timber good on all these claims.

War Eagle, south-east of "Knob-Hill," owned by R. Denzler *et al.* In an open cut in copper-stained eruptive rock is a large body of solid magnetite with very little copper and iron pyrites, running north and south, carrying small gold values. About 300 feet away a 25-foot shaft had been sunk in a dark green diabasic rock, where some hæmatite and copper pyrites were visible, but no ore of any account had been discovered. Timber plentiful.

Missing Link, a fractional claim owned by H. Morgan and Geo. Ramberger. In an open cut can be seen a large body of solid fine-grained magnetite, with a very small amount of copper and iron pyrites.

Snow Shoe. The workings on this claim are close to the main waggon road, three-fourths of a mile east of the "Stemwinder." On this property and the adjoining "Gold Drop," are large out-crops of mineralized eruptive rock that have attracted much attention, and may yet prove very important as proper development is done. On this claim some work has been done in two places, and south of the road is seen a zone from 30 to 50 feet, of light green feldspathic rock carrying much hæmatite or specular iron and some copper pyrites. Low gold values are also present, and it is said fine free gold has been panned out of the rotten surface material. There is considerable calcite in this zone, which, apparently from the limited amount of work, dips to the east at a not high angle, as a diamond drill hole at 10 feet entered, and in 30 feet passed through a body of this heavily mineralized rock, which ground up into sludge, and did not give a solid core, while a second hole 40 feet west of this, is claimed to have started in mineral, and after passing vertically through 54 feet of this material, entered barren rock.

South of this, 400 feet, open cuts and drill holes have shown this mineralized rock there. So far this material has proved to be of very low grade, assaying from $1 to $11 in gold per ton, and 1 to 5 % copper, but if exploration in depth of this strongly mineralized zone betrays bodies of better grade ore, as it is very suitable to smelting, very important ore-bodies may yet be found to underlie the surface showings. The owners, R. Denzler and Wm. Gibbs, Greenwood, lately bonded the claim to Mr. P. Clark, of Spokane, who has ordered a complete plant from the Jenckes Co., Sherbrooke, Que., and will explore this property in somewhat the manner it deserves.

Gold Drop. Mr. F. C. Innes, Vancouver, has purchased for the Montreal and B. C. P. and P. Co., this claim lying west of the "Snow Shoe." Considerable work has been done, especially with the diamond drill, but not enough to yet show the trend or dip of this zone, also mineralized with yellow copper and hæmatite and carrying gold, which has an east and west trend along a large body of grayish porphyry. To the east a tunnel has been run in over 120 feet in a southerly direction, in which there is much solid copper and iron pyrites, and also mixed ore with much calcite. At 120 feet, what resembles a fault-wall was struck, beyond which the rock, here a regular agglomerate, is barren.

Considerable prospecting was done with the diamond drill, with the result that a large amount of ore, reported to be worth $10 to $14 per ton, was thus found. No work is now being done.

Rawhide. On this claim, lying south of "Snowshoe" and "Gold Drop," is a zone, with an apparent trend north and south, of diabasic rock, mineralized with chalcopyrite (or copper pyrites), calcite, but very little hæmatite. An open cut, 6 to 12 feet deep, discloses nearly 50 feet of this copper bearing material, which will, as so far shown, have a low average copper percentage; but this surface showing will justify much more extensive and careful development work. Mr. Gibbs, from samples taken by himself, has got from $3 to $18 in gold and 2 to 3 ounces of silver per ton, and these values do not seem to be dependent upon amount of copper present. Along the trend of this zone the surface is more or less copper-stained. Owned by D. McInnes, Thos. Tighe, R. Denzler, and Wm. Gibbs.

Curlew, a fractional claim, on which appears the continuation of this zone, that may cross one corner of the "Snowshoe."

Monarch, owned by Thos. Humphrey ; lies south of the "Gold Drop." In iron-stained, decomposed rock a shaft was sunk 75 feet, where a small vein of yellow copper ore showed at the surface.

Brooklyn. This claim, area 600 by 1,500, located in 1891, owned by G. W. Ramberger, Jos. M. Taylor *et al.*, and lying west of the "Stemwinder" and "Montezuma," possesses a strong ledge, running north and south along a smooth wall of marbleized limestone, dipping east nearly vertically. The ore, lying in a highly stratified greenish rock, is chalcopyrite, feldspar, calcite, and a little hæmatite finely laminated, with as yet small gold values.

Considerable prospecting has been done :—(*a*) An open cut showing 20 feet of mineralized but decomposed rock, the dirt covering of which is said to have shown fine colours of gold on panning : (*b*) North 100 feet and up the hill is a 27-foot shaft along the steep lime wall, all in this fine-grained, banded ore, samples from which, assayed by the owners, gave 3 to 4 per cent. copper, $3 to $5 in gold, and 1 to 3 ounces of silver per ton. There was water in this shaft, but further work was to be done here, as depth showed decided improvement in the quality of the ore : (*c*) North 100 feet is a small cut showing 12 feet of light-coloured quartzose rock, carrying no sulphides, but said to have gold values. Farther up the hill two small openings showed the same stratified rock, but slightly impregnated with copper pyrites. To the north lies the *New York*, just being prospected, to the south the *Idaho*, already described.

SUMMIT CAMP.

This camp, lying at the head of Fisherman Creek, is two miles by trail from Greenwood and about eight by road, completed this fall, from the town of Grand Forks. It is in the Grand Forks recording division. Here again the mineral deposits lie in the altered eruptives, in which are isolated areas of crystalline limestone and bosses of granitic rock. The mountains are rounded, not high, and have little timber on their summits, and fires have devasted much of the thick forests on the slopes.

Oro Denero. Title, Crown grant ; area, 51.65 acres ; owner, W. A. Corbett *et al.*, Greenwood. At one point an 8-foot hole had been sunk in a large body of magnetic iron, carrying a very small amount of copper pyrites, here nearly 30 feet wide and trending north and south. Several hundred feet south another 8-foot hole showed 4 to 5 feet of mixed quartz and country rock, impregnated with yellow copper pyrites and traces of bornite. In other shallow cuts along the strike (N. 20° W.) was seen copper-stained rock with small stringers and splatches of copper pyrites. No work was being done. Fair amount of timber.

Emma. This group, comprising the *Emma*, *Minnie Moore*, *Mattie Davis*, *Jumbo*, and *Mountain Rose*, owned by Farrel and Midgeon, Butte, are reported sold to Messrs. McKenzie and Mann, Toronto, gentlemen of very strong financial standing.

Emma. Crown-granted ; area, 48.5 acres ; lies north of the "Oro Denero," and possesses a large body of massive, fine-grained magnetic iron, with traces of copper and iron pyrites, and, it was reported, some gold and silver values. This ore body occurs in the diabasic rock at its contact with a small area of hornblendic granite, and in places were coarsely crystalline magnetite, garnet, and calcite. A shaft 107 feet deep (nearly full of water) had a cross-cut, said to run for 27 feet through this iron ore. Timber plentiful. The other claims in this group were not visited, as no work was being done.

R. Bell, Aspen. Situated on trail, about one mile south-east of "Emma"; owned (June) by J. Keoughs, O. R. Butts *et al.* On the *R. Bell*, considerable work had been done, but, being full of water, little could be seen except that at the surface. (*a*) Main shaft, 70 feet deep, was sunk in country-rock to strike the ledge that runs north and south and dips E. 60° : (*b*) A 30-foot shaft and 16-foot cross-cut showed mixed ore, cr a small amount of yellow copper pyrites with a little zinc blende and iron pyrites in the dark green diabasic eruptive. A small gold value or $2 to $3 is said to be present ; also high silver values in the samples of solid sulphides : (*c*) A small open cut shows slight mineralization. Near by is a large exposure of massive magnetite, with very little or no copper. There is here much limestone traversed by dykes and sheets of eruptive rock. Elevation about 3,200 feet above sea level.

Cordick. Area, 51.65 acres; title, Crown grant; situated north of "R. Bell"; owned by Capt. R. C. Adams, Montreal. On this claim a small shaft had been sunk, where some copper pyrites were seen interspersed with the eruptive country rock.

B. C. This claim had been but recently discovered by J. Keoughs *et al.*, about one-half mile north of the "Cordick," and at an elevation of about 3,800 feet, but with only two shallow trenches dug, it was one of the most promising prospects seen in the district, as in one of these cuts, with one wall of limestone, was seen the highly-decomposed iron-stained surface ledge matter below which, for a width of 20 feet, was mixed ore or copper pyrites in the light green feldspathic rock, with considerable of the solid copper ore. A small stream was close by and Loon Lake lay about 1,200 yards distant and 820 feet lower in elevation. Since then the claim has been bonded for $60,000. Cabins, etc., have been erected and a shaft is being sunk in mineral. A steam plant has been installed, and 26 men are now engaged vigorously opening up this claim.

Other Claims. Many other claims have been staked off in this locality, but very little work was being done, or had been done.

Wellington Camp.

The Wellington Camp in the Grand Forks Division lies about 2 miles south of Greenwood Camp, 7.5 miles from the town of Greenwood and 14 from Grand Forks. The waggon road between these two places passes close by all the workings on these claims. The country here comprises well-timbered, low-lying hills sloping down to Fourth of July Creek, and again is seen the greenish feldspathic country rock with irregular areas of limestone and some large bosses of the highly crystalline granitic rock, probably diorite.

Golden Crown. Area, 51.65 acres; title, Crown grant; owned by the Brandon and Golden Crown Gold Mining Co., Limited, Rossland; capital stock, $1,500,000; President, Hon. T. M. Daly; Superintendent, S. H. Collins, Greenwood.

This property is being vigorously developed, and more of such work would rapidly show up the true worth of this large district. There has been found a number of, as yet, small veins in the same eruptive rock, in which the ore is gold-bearing copper pyrites and pyrrhotite in a quartz gangue. The main tunnel (June 22) was in 60 feet and was being run to cut five of these veins, with 280 feet to go to tap a vein, No. 2, on the top of the hill at a depth of 80 feet. One vein, No. 1, of this kind of ore described, 10 to 12 inches wide, had been crossed. A shaft had been sunk 60 feet on vein No. 2, which was 1 to 20 inches wide, of decomposed quartz and the sulphides from which high gold assays had been obtained, and the enclosing country rock was somewhat mineralized and also assayed a little in gold. Thirty feet south of No. 2 is vein No. 3, a small vein of quartz and sulphides exposed in a small cut. Near the road vein No. 5, as shown in a long trench, was 3 to 4 feet wide, of quartz, copper and iron pyrites and pyrrhotite, good samples of which have assayed $35 per ton in all values. It was proposed to sink a shaft here, and this is now down about 30 feet.

Mr. Collins kindly submitted the following assays of average samples: Vein No. 1, gold, $1.65; silver, 2 ounces; copper, 6.1%; Vein No. 5 (at the road) gold, $8.26; silver, 1.1 ounces; copper, 2%; Vein No. 3, gold, $2; silver, 1.5 ounces; copper, 8%; Vein No. 2, gold, $12.81; silver, 5 ounces; copper, 8.2%. Much higher assays have been got, but these will give some idea of the ore as found at the surface. Good cabins had been built, and the Boundary Creek "Times," October 15th, states that adequate hoisting and pumping machinery has been ordered to sink 500 feet. No. of men employed, 13.

Calumet. This claim lying east of the "Winnipeg" was under bond to this company, and prospecting had disclosed a small vein, a few inches wide, of quartz and sulphides near the diorite mass, supposed to be the extension of the "Winnipeg" vein.

Winnipeg. Title, Crown grant; area, 26.7 acres; lying along the south line of the "Golden Crown." Owned by D. McIntosh *et al.*, since reported sold to a company. This property has attracted much attention, but little can be said as work was suspended and, the workings being flooded, could not be entered. However, openings have been made on two parallel leads 75 feet apart, traced only for short distances on a trend of N. 70° west in the usual feldspathic rock but near the large exposure of highly crystalline rock or diorite.

Small Vein.—From 1 to 12 and 16 inches wide along a well defined line of fissuring of nearly solid iron pyrites, with traces of mispickel and copper pyrites, assaying $12 to $15 in gold, exposed in a 15-foot shaft and small open cuts.

Main Vein.—Here there is small shaft 35 feet deep with a cross-cut of 17 feet close by 59 feet deep with cross-cut. On the dump the ore is seen to be either copper pyrites and pyrrhotite in quartz, stated to assay as high as $50 in gold per ton, or solid pyrrhotite assaying $9 to $15 in gold. This veins here shows for 100 feet, and is supposed to be the No. 4 vein showing on the "Golden Crown" 350 feet to the west. Considerable ore was on the dump, and some had once been sacked for a trial shipment, but nothing had been done here for two years. Work on a good scale is now being conducted by a company in control of this property.

OTHER CLAIMS.

Of course many other claims are here located, but little work has been done on any, and none on many.

Keystone claim, owned by Jos. Taylor *et al.*, located near the forks of the road, showed a decomposed iron-stained rock with small stringers of iron pyrites and pyrrhotite.

Sinbad.—Area, 1,500 by 1,500, owned by J. Fraser *et al.*, lying 1,500 feet north of "Golden Crown." Small vein running east and west (same direction as "Golden Crown" vein), 12 to 20 inches wide of decomposed, honeycombed quartz with iron pyrites. Good cabins had just been erected near a small shaft 20 feet deep.

PASS CREEK.

Considerable prospecting and a little work was being done on Pass Creek and its tributaries, where deposits of nearly solid pyrrhotite, carrying very small gold or silver values, are found.

MAIN KETTLE RIVER.

This year there was a rush of prospectors up the main Kettle River from Rock Creek, and a good many claims were pegged off, mostly on silver-galena veins, but only some properties were seen at "Crown Point Camp," six miles up the west side, by road from Rock Creek. Up the valley are seen both the highly altered sedimentary rocks and granites, but these claims were located on veins in the same greenish feldspthic eruptive rock found all through this region.

Crown Point.—Elevation 3,000 feet, or 900 feet above Kettle River, owned by Jno. Douglas *et al.* In a very small isolated patch of the crystalline limestone, surrounded by the eruptive rock, a shaft 25 feet deep was being sunk in a body of scattered galena, iron pyrites and blende; narrow stringers of galena traverse this mass of limestone, but no definite trend could be seen to this ore body, nor had it been traced for any distance or outside of the limestone.

Number Three.—A very narrow stringer of galena ore was seen near the line of contact of eruptive with the altered sedimentary rocks.

Sophia Sherron and *Number Two*, near their dividing line, each claim had a small hole sunk on a vein 1 to 2 feet wide, traceable for a short distance, of honeycombed quartz carrying coarse cubed galena. These claims are all well timbered.

GRAND FORKS—BROWN'S CAMP.

At the junction of the North Fork and Main Kettle River, in a wide valley in which are several fine fruit and grain ranches where irrigated, the incorporated town of Grand Forks has grown rapidly, but at the present time everything is very quiet here pending the coming of a railroad. Quiet a number of claims had been staked off near by and some work was being done, but only some properties in Brown's Camp, about ten miles by road trail up the North Fork, were seen. Most of this country is well timbered, and the North Fork has fine water powers.

Volcanic.

The *Volcanic* and *Iron Cap*, located on a bold bluff east of the river, presents an enormous showing of deep red and brown decomposed iron-bearing rock, or gossany material, that can be plainly seen at the distance of several miles. On examination it proves to be a large area of this greenish feldspathic rock, impregnated with a large amount of pyrrhotite, which on decomposing has formed this gossan, often a foot deep of soft, sintery mass. Part of the band of the crystalline limestone has been involved in this eruptive rock, which in turn is crossed by several dykes, and on the face of this bluff two areas, each over 500 feet wide, run up for over 1,000 feet.

Very little work has been done in this mineralized rock, that makes a remarkable land mark, except some shallow holes that show the solid pyrrhotite-impregnated rock, but near the foot of the bluff a tunnel has been run in 345 feet without entering this mineralized rock, so, practically, little or nothing has yet been done to prove the existence or character of the ore-bodies that might underlie this great out-crop. So far, very little copper sulphides have been found in this mass, and only very small assay values in gold are obtained. The owners, Mr. Brown *et al*, bonded this property to the Olive Mining and Smelting Company, but no work, other than assessment, was done during the past year. Capital stock, $20,000,000.

Pathfinder. Elevation, about 3,200 feet. This claim, owned by the Pathfinder Mining, Reduction and Investment Company, Secretary, James I. Walker, Grand Forks, lies about 2.5 miles northerly from the "Volcanic." The country here is bare and very rocky, *i. e.*, gneisses, granites, syenites, etc. In a boss of the greenish, eruptive rock a few open cuts trace out a zone mineralized with pyrrohotite for about 1,500 feet, and a shaft 5 x 7 feet had been sunk 30 feet, where massive pyrrhotite was found in irregular masses and stringers. This ore carries very little copper, but assays are reported of $8 to $56 in gold, and 2 to 12 ounces in silver per ton. Good cabins had just been erected, and development was in progress.

Standard, lying east of "Pathfinder," shows the iron-stained rock, but no ore as yet. A little work was being done.

Tiger, south-east of "Standard, shows some pyrrhotite.

Hidden Treasure, east of "Tiger," shows some quartz with pyrrhotite.

Diamond Hitch, south-west of "Pathfinder," owned by F. Ralston, *et al* has a considerable amount of solid pyrrhotite, on which five men were working. No values of this ore could be ascertained.

Seattle. This claim, and three others, owned by the Seattle Gold Mining and Milling Company, capital stock, $6,000,000, lies on the west slope of the North Fork, about eight miles by road from Grand Forks, and two to three miles south of the "Volcanic." The formation here is very highly altered stratified rocks, rendered quite crystalline in structure, and running parallel with this stratification were three or four bands from a few inches to 2 or 3 feet wide, mineralized with magnetite and a small amount of copper and iron pyrites, but in the small amount of work done very little ore of any kind was seen. The timber here is plentiful and good.

Wolverine, *Humming Bird*, and *Miami*, also located in this district, were not seen, but assessment work had been done when some pyrrhotite and chalcopyrite were exposed.

Christina Lake District.

Considerable prospecting has been done here during the past two years, but no reports could be got other than of finds of very low grade sulphides, and this district was not examined.

OSOYOOS DIVISION.

Fairview Camp.

Fairview Camp is located about 2½ miles west, and 500 feet above the Okanagan River, on the east flank of the rather low range of mountains separating the Okanagan and Similkameen Valleys, and by stage-road is 28 miles south of Penticton, 29 miles west of Camp McKinney, and 12 miles north from Osoyoos, where were the offices of the Gold Commissioner of the southern portion of Yale.

The mineral claims so far at all developed lie on a series of foot-hills or benches, a few hundred feet above the Okanagan Valley, down on a flat in which, below the narrow gulch in which the settlement now is, a townsite is laid out, where one of the mining companies has since erected a large hotel. Nearly all the claims are very easy of access by road or trail, but work is now confined mostly to the operations of the "Tinhorn" and "Smuggler" Companies, and the "Joe Dandy."

GEOLOGY.

The veins for the most part lie in a series of very highly metamorphosed stratified rock, consisting in most part of very quartzose schists, quartzites and some gneisses, separated into two areas or belts by a narrow spur of syenite granite that runs south-easterly down the gulch from the main area of granite, which is very predominant all through this part of the district. On either side of this spur the stratified rocks dip away from the eruptive rock, but conform in strike, especially on the northerly side, with the trend of the spur. The northerly area in which are the oldest claims, such as the "Stemwinder," "Morning Star," the Strathyre properties, etc., etc., is from one to one and a half miles wide between its granite confines, and comprises mostly quartzose schists and some slates and gneiss, while the southerly belt where work is in progress on the properties of the Tinhorn and Smuggler Mining Companies, consists mostly of quartzite, with some quartzose schists extending, it is supposed in a large area, up to the summit of the mountain. The granite is mostly light-colored or greenish, with a silvery white mica, but in the spur above mentioned is practically a syenite, very little quartz showing.

THE VEINS.

Quartz veins occur both in the granite and in the stratified rocks, and may be thus classified and described :—

(*a.*) *In the Granite.*—So far as developed, the veins in this rock have proved very limited and uncertain, in that on most of the claims only isolated exposures of quartz have been found that can be traced only a short distance along the strike, or two or three disconnected exposures may be uncovered by stripping; however, but very little work has really been done on such claims, other than sinking shallow shafts on these exposures. On the "Columbia," located on the spur, a quartz vein has been traced almost continuously for the length of the claim, but on the "Susie," not examined, there is said to be a single exposure of white quartz, with some sulphides in places, 25 to 30 feet wide and 94 feet long, but with no further extension along the strike, although more extended prospecting may yet disclose its continuance in the granite.

(*b.*) In the *Schists* and *Quartzites* by far the most important quartz ledges are located, and with a few exceptions, all such veins conform strictly with the stratification of the formation, both in dip and strike, lying without any gouge-matter tightly against the country-rock, from which, however, the vein matter breaks off clean on shooting. There are several veins in this belt, five being reported on the "Stemwinder," a claim 600 feet wide, and same can be traced almost continuously for several thousand feet, but varying much in width, often 5 to 6 feet wide, then suddenly widening out to 10 and 12 feet, and even 20 or 30 feet, to as suddenly narrow down to a few inches or a very slight trace, this rapid increase in width occurring also in depth, as seen on the "Brown Bear" (*see* illustration), where the vein five feet wide on top increases to 18 in depth of 60 feet. The quartz in the veins always has an apparently stratified structure or plans of cleavage parallel to the walls. Faulting is evident in some of the properties but dislocations greater than a few feet were seen only in one or two places. The veins cutting across the formation have not been traced as yet for any distance, except perhaps in the "Wide West," where the vein appeared to cross the dip of the stratification at a high angle, with considerable gangue along the vein, and especially along the smooth wall where the vein was pinched or barren of quartz.

QUARTZ.

Nearly all the gangue is a milky-white, semi-translucent, very compact quartz, weathering white on the surface. Some sulphides occur, such as iron pyrites, galena, blende, chalcopyrite and pyrrhotite segregated at times in bunches, oftenest near the foot-wall, but very scantily scattered through the bulk of the vein, which will consist of almost perfectly free-milling quartz, so that if treated en masse the percentage of concentrates would be from ½ to 1 per cent of the whole, but in the case of the large bodies of quartz the percentage would likely be even less. From the 2,700 tons milled from the "Morning Star," about 1 % was saved by the vanners. Free gold is often found, and fine samples have been broken out; good prospects can often be got by crushing and panning samples, while the highest assays are obtained from the quartz most mineralized.

In the southerly area, as in the Tinhorn and Smuggler properties, some of the quartz is white, but much is of the bluish-white character often distinguished with difficulty from the adjacent quartzite, which is also impregnated to some degree with pyrites. Tellurium and tellurides are said to occur in this ore, but no tests have been made to ratify this in this office.

VALUES IN THE QUARTZ.

Although a very large amount of quartz, probably one of the largest showings in the Province, is found at this camp, it is difficult to arrive at its probable average value, although some idea can be reached by the bullion returns for the 2,700 tons of "Morning Star" ore, which was milled without sorting and yielded per ton $11 by amalgamation and $.92 in the concentrates.

It is not believed by those who have made many tests, however, that the ore of the camp will average such values, that from $4 to $7 per ton will be found to be much nearer (if not even too high) the gold contents of these large masses of quartz; and, in any case, to become profitable, this ore will have to be mined and milled in very large quantities after the best and cheapest methods of mining, transportation, and milling, and that a company having a mill of large capacity on the Okanagan River, where only is sufficient water, will have to control several claims, so as to be able to mine a large tonnage of ore.

Other mill-runs have been made, such as from the "Rattler," "Brown Bear," "Wide West," and "Joe Dandy," but returns from such are not available. During the past year, new companies have acquired or located property, now being developed, from which high *assay* returns have been got, but it is yet too soon to decide as to the probable extent of ore-bodies or *production* values, as the amount of underground work is as yet very small and mill tests are wanting, assay returns on samples being a very unsafe criterion, in fact wholly unreliable.

However, these large bodies of low-grade gold-bearing quartz invite the careful investigation of those prepared to undertake mining and milling on a large, hence the cheapest, scale, and the work now under way will further help, to a certain extent, to prove up the resources of this camp.

WATER.

A small creek, or Reed Creek, capable of furnishing enough water for the 10-stamp Strathyre mill, and a second small stream, two miles south, on which is being erected the Tinhorn mill, supply such water as there is on the mountain-side at this point, but the Okanagan River, 2.5 miles distant, carries an ample supply, and can easily be reached by an aerial tramway or small narrow-gauge railway. The Okanagan Falls have been secured by the Okanagan Power Co., whence it is proposed to transmit power for milling purposes. All milling will have to be done at the Okanagan River, as there is not enough water in the small creeks on the hills to permit the continuous run of a good-sized mill, as the water becomes very scarce in fall and winter.

TIMBER.

There is a good supply of mining timber on the slopes of the mountains above the mines, that on most of the claims being limited in amount.

DESCRIPTION OF MINES.

Morning Star. This claim and the "Black Diamond," area, 11.2 acres, and Crown-granted, are owned by S. Mangott and P. McEachern, Fairview. On the "Morning Star" are two well-defined leads, strike, N. 45° W., dip, 45° to 55° N.E., on one of which, lying at or near the spur of eruptive rock, is a large exposure for about 160 feet of quartz about 30 feet thick, from which 8 to 900 tons were mined and milled, the values in which were not kept separate. The mass of the quartz contains very little sulphides, except at the hanging-wall, but along the foot-wall it is more or less decomposed, of which, where exposed to the atmosphere, the whole becomes reddish-rusty stained. A shaft has been sunk on the hanging-wall side 70 feet, there intersecting the lead, into which a drift has been made for 7 or 8 feet, all in quartz, but water filled these workings at time of visit.

The other vein, 160 feet to the north-east, has been opened up for several hundred feet by shallow inclines, one of which is down on the vein 140 feet, with drifts at the 100 foot level 50 feet each way, showing the vein to be from 2 to 6 feet wide. There is also a small stope near the surface, and all the ore taken out from these workings sent to the mill is said to have yielded $15 on the plates per ton. The quartz is crushed and very rusty with iron-stain, as it contains a fair amount of sulphides, and free gold was seen by the writer in samples from this incline and another 30 feet deep, where the vein was 2 or 3 feet wide. For several months in the winters of '92-'93 and '94-'95 the Strathyre stamp-mill, 4,000 feet distant by a good road, down grade, was leased, and the 2,700 tons, yielding $32,000, as stated, or $11 per ton, were run through, although much trouble was given by the boiler and engine in the mill. Since then no further work has been done. (*See* illustration.)

On the "Black Diamond," a claim lying to the south-west, is a nearly vertical quartz vein, running N. 20° E., in which a shaft has been sunk 35 feet, opening up a vein 2 to 4 feet wide of the same character of ore as found on the "Morning Star," but the vein has not been traced for any distance.

Stemwinder. This claim, 600 x 1,500 feet, Crown-granted, owned by F. Gwatkin and Geo. Shehan, Fairview, is one of the earliest located, or in 1888, It lies 3,000 feet north-west of the "Morning Star," the "Brown Bear" and "Silver Crown" intervening, and is said to have five quartz veins, three of which were inspected. The veins run N. 50° W., and dip north-easterly 60°, and on one vein that runs through at least six claims, small open cuts and shallow shafts exposed 4 to 12 feet of fine-looking quartz, with the usual sulphides of the camp, mostly near the hanging-wall. Other cuts have been made on some of the other veins, on one a 50-foot shaft, showing a strong vein somewhat honeycombed and much iron-stained where exposed to the weather, so that altogether a large amount of quartz was opened up along the surface of this claim, stated to average $7 in gold per ton, although no mill tests had been made to corroborate this.

Fine samples of free gold have been found, and much of the loose soil near the veins gave good prospects when panned, but no work is being done this year to further develop the large showings on this claim.

Strathyre Company. This company was the first to undertake work of importance in this camp after five properties, the "Rattler," "Ontario Fraction," "Brown Bear," "Wynn M." and "Wide West," had been purchased. These claims are scattered, four of them being on the belt along which are the "Morning Star" and "Stemwinder," while the "Wide West" is a mile easterly from these, but only on two, the "Brown Bear" and "Wide West" has much work been done. On Reed Creek a ten-stamp mill with five Frue Vanners, self-feeders but no rock crusher, and an engine and boiler not at all suited for this work, as it proved inefficient to keep the mill running constantly, was erected on the site of a small five-stamp plant built by the former owners of the "Rattler" claim.

Roads were built to the different properties, and considerable ore was milled from the "Brown Bear" and "Wide West," but mostly from the latter, the results of such crushings being unknown to the writer, but work has been suspended for some years now as the mill is not large enough or properly appointed to treat with profit the large amount of low grade quartz on the claims now to be described. From the "Rattler," "Brown Bear," "Ontario Fraction" and "Wynn M.," it was a down-hill haul to the mill, but some heavy grades had to be climbed in teaming the ore up from the "Wide West," three miles distant.

Brown Bear. This claim, the south-east extension of the "Stemwinder," shows two, at least, well-defined ledges running throughout its length, north-west and south-east, and dipping north-east, on one of which, 1 to 14 feet wide, were several cuts and an incline 60 feet deep in which the ledge was about 5 feet wide on top, and 16 to 18 feet at the bottom, of a glassy, white quartz with very little sulphides. A cross-cut tunnel was run 300 feet intersecting this vein at 100 feet, along which drifts were run and some stoping done, while beyond, 2 or 3 other veins were cut, but where they had become very small. Another vein, 100 feet to the south-west, 5 to 18 feet wide, but becoming smaller at the south-east end, where it is probably cut by the tunnel, is exposed by a series of surface cuts, the quartz being similar to that found elsewhere in the camp, with a small percentage of iron pyrites and galena.

The *Wide West* was the claim most worked by the company on a vein running north-east by south-west, and dipping south-east 80° to 85°. Considerable ore was got from a surface cut on top of the bluff, but a tunnel was run in on a vein 2 to 4 feet wide, which suddenly widened, at 150 feet, to 8 to 10 feet, where stopes were run up to the surface, and a shaft was sunk 100 feet, just beyond which the vein suddenly pinches, but a smooth wall with gangue was followed for some distance when the quartz came in again and another stope was run up with a width of 3 to 6 feet of ore. The quartz is much the same as found on the other claims, but a large amount of white, barren-looking was sorted out, the mineralized portion being sent to the mill, where it is said to have yielded $11 per ton on the plates.

Wynn M., is the north-west extension of the "Stemwinder," and small shafts are down on the vein, 1 to 5 feet wide, which trends to the west following along the granite spur, or north 70° west.

On the *Rattler* an incline was sunk 100 feet by the former owners on a small vein, but nothing was done by the company.

Silver Crown.

This claim, 600 by 1,500 feet, Crown-granted, agent T. Davis, Fairview, lies as the S. E. extension of the "Brown Bear," and has been developed by a cross-cut tunnel 250 feet long, where at 80 feet a vein of quartz, more or less mineralized, and 2 to 5 feet wide was intersected and followed by 100 feet of drifts and a winze. Good assays have been got from this rock, but no information as to average values was to be obtained. In the continuation of the tunnel two or three small quartz veins were also cut, but no exploration of any of them made.

The Evening Star and *August Fraction*, owned by John F. Stevens and H. Rose, lies as the S.E. extension of the "Morning Star," the vein from which has been traced by small open cuts nearly throughout the whole length of the claims, but no work beyond assessments has been done.

The Columbia, 1,500 by 1,500 feet, lying south of the "Rattler" and owned by E. Morris, has a quartz vein 1 to 4 feet wide, strike N. 70° W., dip S. 20° W. 80°, traced by open cuts through the syenitic granite for nearly the whole length of the claim, and a cross-cut tunnel is now in 80 feet, but has not yet reached the ledge.

Last Chance, Crown grant, owned by Thos. McAuley, Midway, has a quartz vein 1 to 2, and even 4 feet wide, traced by open cuts for 400 feet. A small shaft, full of water, had been sunk and the vein matter was the white quartz with some sulphides, as copper and iron pyrites, and a little galena banded or much crushed. The formation here, which the vein follows in a N.W. by S.E. course, is a very slaty rock, but no gouge along the walls is apparent.

Comstock, owned by Wm. Dalrymple *et al.*, lying about 2,000 feet north-westerly from the Wynn M., and about 600 feet above it, has an exposure for 100 feet of rusty weathering white quartz, honey-combed in parts by the decomposition of sulphides, 15 to 20 feet wide. Two open cuts and shallow shafts had been made while a considerable amount of quartz was piled on the dump, samples from which are said to give good prospects on panning. This vein, but there only a foot wide, crops out in several other places along the mountain-side.

Joe Dandy.

The *Joe Dandy*, *Daisy*, *Atlas*, Crown granted, and the *Belmont*, surveyed for Crown grant, are owned by the Fairview Gold Mining Company, Ltd., London, England; general manager, J. R. Mitchell; superintendent, E. F. Ballard. These claims lie at the foot of the mountains, and the vein, strike N. 65° W., dip, northerly, 36° to 60°, crosses two small ridges, on the summit of one, where the vein lay between a dyke of porphyitic rock and quartzose schists, where considerable ore was raised by the original owners and milled at a small stamp mill in Reed Creek, below the hotel in Fairview, yielding, it is reported, excellent returns. The vein, so far developed, is not large, or from 1 to 3 feet wide, but the quartz is bluish-white in colour with sulphides, and gives good gold assays wherever thus mineralized. At the foot of one level on the Joe Dandy tunnel, No. 2 had been run westerly for nearly all the distance along the vein, with an upraise on a cross-cut vein, running west and north-east, of 40 feet to a small cross-cut tunnel.

On an upper bench, 600 feet west of No. 2, a cross-cut tunnel, No. 1, was in 225 feet, while on the vein itself a short tunnel had been driven, opening up 3 to 4 feet of ore, and the west shaft was down 60 feet on the vein, which varies much in width. A steam hoist will soon be installed at this point, and in the meantime all ore extracted is being kept separate from waste rock.

Surveys had been made for an aerial tramway, about 10,000 feet long, down to a mill-site on the Okanagan River, where it is proposed to erect a 20-stamp mill at a point four miles below the falls, where a plant for the generation of electric power is projected, such power to be used at the mine and mill.

Tinhorn G. M. Co.

The *Tinhorn*, *Big Horn*, and *Fortune* had been acquired by the company of which W. A. Dier was manager, and W. S. N. Wills, M. E., was superintendent. These claims lie in the quartzite south of the granite spur $1\frac{5}{8}$ miles by waggon road from Fairview. On the "Tinhorn" a ledge, bluish quartz, 2 to 5 feet wide in places was being opened up along an east and west strike and a southerly dip, while a large exposure of white-weathering quartz similar to that found on other claims already described was not yet being tested.

The locators of the claim put their discovery post on this out cropping of white quartz, and ran in a cross-cut tunnel under it without again finding it. A tunnel 180 feet long was being pushed ahead, but had passed into the quartzites, while near the entrance, nearly 9 feet of the bluish quartz, carrying some sulphides as iron pyrites and a little galena, and, it is claimed, some tellurides, were followed for some distance until cut off by a fault, near which a winze was being sunk 26 feet deep, May 30th, with 3 to 5 feet of quartz all the way down.

Farther on in the tunnel a connection is made with a shaft sunk 64 feet, 45 feet of which was on the ledge until a fault, probably the same but of small dislocation, as met with in the tunnel.

Several hundred feet higher up, tunnel No. 2 was just being started where the ledge was 4 to 5 feet wide of banded quartz entirely conformable with the enclosing schistose quartzite, carrying sulphides as iron pyrites and galena, and copper stained, and as the ledge runs into the mountain, mining through tunnels will be followed. All material from the ledge is being stored on separate dumps.

On the "Fortune" two tunnels were being driven westerly along the quartzite formation.

Mill and Mill-site—Immediately below a mill-site had been located on Tinhorn Creek, whither a three-rail tramway, 540 feet long, runs from the main tunnel to the mill now constructed by the Joshua Hendy Company, San Francisco, in which are 8 2-stamp triple discharge stamps, self-feeders, crusher, vanners, and 100 h. p. Corliss engine, 120 h. p. boiler and an electric lighting plant of 450 16-candle power capacity. Sufficient water for such a size of plant was claimed to run all the year in this small creek.

It was also claimed by the management that high assays were obtained from the rock now being mined, especially that rock carrying the most sulphides, but since the completion of the mill, several hundred tons have been run through, with results that were very disappointing. The supply of water is now found to be inadequate, and as the mill is not frost-proof, milling has been stopped. However, later on other mill-runs may prove up better grade rock.

Smuggler.

The *Smuggler* (Crown grant), *Revenue*, *Vancouver*, *Mountain Side*, *Skylark*, and a mill-site on Reed Creek, lying between Fairview and the "Tinhorn" claims, are owned by the Smuggler G. M. & M. Co.; president, H. H. Dewart, Toronto; manager, G. H. Maurier, Fairview.

On the "Smuggler" a shaft was down 110 feet along the ledge which runs nearly east and west with the stratification. A horse-whim was being used for hoisting, but a small steam hoister was being put in, and on the dump was accumulated from the shaft considerable quartz of a bluish-white colour, with some sulphides, which was being conveyed over the waggon road built to the Strathyre mill for a mill-run. About 175 feet below the top of the shaft a tunnel was driven in for about 100 feet, in which was seen a small amount of quartz irregularly scattered along this working and dipping south with the formation. This tunnel and shaft will be continued until connected.

The Strathyre mill has been leased, and Mr. R. Dewar will, after getting the mill in working order, make a series of mill-tests to ascertain the value of and best method for treating the output of these properties, and if developments so warrant it a mill will be erected on Reed Creek on the mill-site easily reached by tramway from the mine. No other prospecting work was seen. Since time of visit about 400 tons have been milled that are reported to have yielded about $8.00 per ton by amalgamation.

THE FAIRVIEW CONSOLIDATED GOLD MINES COMPANY.

This company, with a capitalization of $2,500,000, Mr. W. S. N. Wills, superintendent, has secured a number of mineral claims located in different parts of the camp, on which, as yet, but little development other than enough to secure Crown grants has been done, but further work was being prosecuted on some of these locations, which comprise the "Fannie Morris," Silver Bow," "Nightingale," "Reco," "Standard," "Ocean," "Sundown," "Rob Roy," "Iron Clad," "Quartz Queen," "California" and "White Swan," and of which the first four were visited.

The *Silver Bow*, lying northerly from the Brown Bear, has a vein running north-east and south-west across the formation, on which a tunnel, after cross-cutting for about 75 feet, runs for 75 to 80 feet along a vein 2 to 3 feet wide and 6 feet wide in one place, of a very white quartz carrying a very small percentage of sulphides. Gold values not known.

Fanny Morris, about one mile south of Fairview, below the road to the "Tinborn," has a shaft sunk 18 feet, showing considerable decomposed quartz matter with some sulphides, towards which two men were at work running a cross-cut tunnel.

Nightingale, located N.E. of "Tinhorn," at foot of mountain, where a vein running N., 20° W., of white quartz with iron and copper pyrites and galena, is disclosed for several hundred feet by open cuts and a shaft about 20 feet deep.

Reco has an exposure in one place in the granite of rusty weathering quartz, 2 to 3 feet thick, carrying very little sulphides. It dips N.E, at an angle of 30°, and a shaft has been sunk 30 feet to strike it, but is not yet deep enough. Work sufficient to secure a Crown grant has been, or is being done on other claims. From the different claims, samples according to the prospectus of the company have given high assay values, but no estimate can yet be found as to the amount and value of the quartz that may be developed on these claims, as only mill runs can afford decisive and reliable information.

Winchester. This claim, owned by the Winchester G. M. and M. Co., Mr. Wills, superintendent, lies in the granite, easterly from the "Wide West," and has exposed in one place, only for about 150 feet, a vein of white quartz 1½ to 2 feet wide, strike N. 10° E., dip S. 80° E. 60°-75°. A shaft had been sunk 25 feet on the vein, but 40 feet easterly a shaft was being sunk through a greenish-coloured granite, but at 35 feet had not yet reached the vein.

Comet. The "Comet" and "Western Girl," Crown-granted, owned by Jno. C. Stevens, lie along the westerly side-line of the "Stemwinder" and "Wynn M.," and on the "Western Girl" a quartz vein 4 to 5 feet wide, strike N. 70° W., showed free gold and some iron and copper pyrites and galena, and two shafts, 75 feet apart, had been sunk 25 to 30 feet. On the "Comet" a vein running N. 45° W. was uncovered by some open cuts about 75 feet west of the vein on the other claim, a vein 3 to 5 feet wide with ore of a similar character to that found in the adjacent properties.

Other Claims.

Many other claims have been staked off, on many of which more or less quartz is showing, but nearly all the leading properties have been described above. The work now in progress will help, to a great extent, to give more knowledge concerning the values contained in the large amount of quartz, large assays are easy to obtain where the sample is picked, but that all-important information, the average milling value, must be obtained from the results of careful mill-runs on a large tonnage of ore.

CAMP McKINNEY.

Camp McKinney has been founded and brought into prominence by the continued success of the "Cariboo-Amelia" mine, which since the erection of its stamp mill in 1894 has been worked continuously, paying its owners dividends to date of $188,965, with the promise of much more while the stamps keep up their unceasing rumble. As in Fairview, a large amount of gold-bearing quartz is now in view, but while much information from assays and panning-tests seemingly point to the fact that the veins so far exposed by comparatively superficial prospecting, carry ore of a very low grade, it yet remains to be proven by more extensive underground workings and mill tests whether these quartz ledges now lying untouched cannot be made profitable if developed and milled in a proper manner, or whether other pay shutes may not be found.

The history of the camp begins in 1884, when the "Victoria" vein on Rock Creek was discovered a short distance above the placer diggings of early days, but little was done until 1887, when the "Cariboo" vein was found standing boldly out of the ground with free gold showing (*see* illustration), but even then progress languished until the present company began work in earnest.

Location.

Situated at an elevation of 4,600 feet above the sea level, or 3,500 feet above Okanagan Lake, on round-topped hills gradually climbing up to the granite core, Bald Mountain on the east slope of the water-shed between Okanagan and Kettle Rivers. The camp is on the main stage road 56 miles easterly from Penticton and 32 miles westerly from Midway, or 44 miles from Greenwood City. It lies between Rock Creek and the South Fork, and the small mountain stream, Rice Creek, passes through the camp.

GEOLOGY.

Granites and gneisses are developed on a large scale, and also diabasic rocks enclosing very highly altered stratified rocks such as gneisses, quartzites and crystalline limestone, and in all of these rocks veins have been located, although immediately at Camp McKinney the veins are in gneisses and quartzites and probably diabasic rock, the bands of quartzite weathering red and white, and assaying from traces to $4 and $5 in gold. Some of the rock, such as that in which the "Cariboo" vein is being mined, while showing signs of foliation on the surface, is practically massive and greenish in colour, but not quartzose, except as traversed by small quartz stringers.

VEINS.

In this camp the veins in the stratified rock do not conform with the dip and strike of those walls as at Fairview, but cut across the stratification with an east and west trend and a southerly dip of 75° to 90°. Along a series of flat-dipping fault planes of 10° to 30° east, the veins have been thrown, below the faults, to the south for distances of 5 to 60 feet, and there are evidences of one throw of nearly 140 feet. There are minor slips in other directions, but the direction of throw is nearly always indicated by the bending of the vein or by a "tail" of quartz towards the other part of the deposit in the gouge along the smooth fault wall. The main vein, as thus developed, running through the "Cariboo-Amelia" claims, and also the "Alice," "Emma," "Maple Leaf," Eureka," "Mammoth," and other claims, is from 1 to 10 feet wide, with an average width of about 4 feet in the "Cariboo-Amelia."

The first locators, believing this vein ran with the formation, located their claims accordingly, when, on further prospecting, they found that such claims as the "Cariboo," "Amelia," "Alice," "Emma," "Kamloops," and "Okanagan" were staked out across the vein and not along it, or with 600 feet each of the vein instead of 1,500 feet.

Other but smaller quartz veins have been discovered on the "Minnie-ha-ha," "Sailor," "Fontenoy," "Victoria," "Old England," etc., some of which are similar in character to the "Cariboo" lead but with a decided difference in the last two named. On the "Anarchist," located one mile west of the "Cariboo," and on the strike of that vein, a strong quartz vein cuts through the granite not far beyond the line of junction of the granite and the bedded rocks. On the "Le Roi" and "War Eagle" claims, 3½ miles from the camp, in diabasic rocks, has been found a large deposit of iron pyrites and pyrrhotite carrying some gold.

While at Camp McKinney the main or "Cariboo" vein runs east and west, the other quartz veins have quite different trends, as the vein N. 45° E. on the "Sailor," N. 45° W. on the "Fontenoy," N. 70° W. on the "Dolphin," and N. 10° E. on the "Victoria."

ORE.

Most of the quartz is milky-white and compact, weathering white on the out-crops, but rusty red on the dumps from the oxidation of the small amount of sulphides present, or well crystallized iron pyrites with some blende and galena and, in places, chalcopyrite.

Much of the quartz is white and barren looking, the sulphides being mostly near the foot-wall, although sparingly scattered through the whole mass. The quartz of the "Cariboo-Amelia" ore-shute is of a bluish white, with 3 to 3½ % of sulphides, the gold values being in direct proportion to the amount of these sulphides and the size of the vein, the ore becoming very low grade in the narrow parts.

VALUE OF ORE.

Free gold was found in the early work, but from a depth of 160 feet in the "Cariboo-Amelia" mine, two fine samples of gold in bluish quartz were presented to the writer by Mr. Keen. In this mine the gold values are claimed to have decidedly increased with depth, the ore in the upper level having averaged $11, saved by amalgamation on the plates, while now that from the 175-foot level stopes is yielding $15 to $16 on the plates per ton of rock crushed. In depth the amount of sulphides has somewhat increased, until now about 3½ %, the concentrates from which yield from 3½ to 4½ ounces in gold, and 2½ ounces of silver per ton, or $2.50 to $3 per ton of ore, or a total *yield value* of about $17 to $18 per ton for the ore from the lowest workings on the vein, all of which is mined and milled.

On the other claims on this vein on which practically, with the exception of the "Eureka," very little work has been done, ore-shutes like the "Cariboo" have not yet been found, although some very rich rock has been taken out. The mass of the quartz, however, has so far proved to be low-grade, running from $2 and $3 to $10 in gold per ton, much of it assaying only up to $1 or $2 per ton, but it is difficult to presage what more extended development would disclose in other than the shallow prospect holes now put down. The "Victoria" ore consisting of quartz, iron pyrites and zinc blende, has constantly given high gold values on assay.

TREATMENT.

All the quartz ores of this camp will be essentially free-milling when the sulphides will be easily saved by concentration, and sold to the smelters.

WATER AND TIMBER.

Sufficient water for 30 stamps is estimated to flow in Rice Creek, which could be re-used by mills located below each other on this creek, or water could be brought without much expense from the branches of Rock Creek. There is an abundant supply of good timber.

COSTS.

The price of labour is the same as in the other camps of the West, but the freighting charges of $30 to $35 per ton from Penticton increases the cost of supplies. Freight on concentrates to Penticton $10, thence to smelters $5.50, a total of $15.50 per ton. Fire-wood delivered at mine $1.75 per cord.

Cariboo Amelia. These two claims, Crown grants, owned by the Cariboo Gold M. & M. Co. Capital stock $800,000. President, Jas. Monaghan; Secretary, Geo. B. McAuley, Spokane; Superintendent, J. P. Keen; are located along about 1,100 feet of the vein, which runs east and west, nearly vertical or with a small southerly dip. This vein has now been opened up for 600 feet along a continuous but faulted ore-body from 1 to 8 feet wide, average width about 3.5 feet, and to a depth of 175 feet.

On the surface is well seen the dislocation of about 60 feet by the main fault dipping east 30°, the vein there standing several feet above the surface and 4 to 5 feet wide. Three shafts have been sunk, of which the present working shaft is 175 feet deep, while in the gulch down which runs Red Creek, is a cross-cut tunnel 250 feet long, which taps the vein west, then runs on to that part east of the main fault, whence it extends as a drift for nearly 600 feet, 65 to 71 feet from the surface, All the ground is stoped above this level, and also a good deal of the ground below down the main fault. From near the bottom of the 175-foot shaft, drifts extend for some distance along the vein, here 2 to 6 feet wide, and the ground is being stoped out at a rate to keep the ten stamps at work, or 15 to 18 tons per day. This main fault extends down through the workings to the mine, cutting the vein clean off, where it has a width of 2 to 6 feet of the best ore yet mined, and the continuance of the ore-body below the fault to the south is thus assured. The company has as yet done but little dead work, but on the arrival of the boiler for the compressor, the shaft will be sunk another hundred feet, and a cross-cut run to tap this ore below the fault, when another full-sized working shaft will be raised to the surface at a point in close proximity to the site of the proposed new mill.

Plant. At the present main shaft are a single-acting hoisting machine, boiler, and a four-drill Rand air compressor, for which a new boiler is *en route*, after the installation of which a sufficient shaft-house will be built, but a better plant and building is projected when the new shaft is completed. A small steam pump lifts the water to the tunnel level.

Mill. On Rice Creek is the stamp mill, with (*a*) Blake crusher; (*b*) two batteries of 5 stamps each (Risdon Iron Works, San Francisco); stamps 850 lbs. each, dropping 6 inches 85 times per minute; height of discharge, 6 inches; screens, 30-mesh Russia iron; inside copper plate at bottom of screen, 6 x 54 inches; outer coppers, 54 x 120 inches, in 5 plates with 1-inch drop each; (*c*) four double Gilpin County bumping tables; (*d*) tank for heating battery feed-water; (*e*) a 25-h.p. engine (*see* illustration).

The value of ore and concentrates has been stated above, the concentrates containing 35 % iron, 9 % SiO_2, and less than 10 % zinc. Cost of smelting, $3.50 per ton, or a total of $19 per ton for freight and treatment.

Grade of Bulliom. Gold, 635 fine; silver, 340. Cost of mining per ton, $4; of milling per ton, $2.

Over 21,000 tons of ore had to date (June) been mined and milled, or from 500 to 550 tons per month, and dividends to the amount of $188,965 have been declared, $32,000 of which were for 1897.

The tailings are said to run from $1.50 to $2.50 in gold, but in the new mill much closer concentration of the auriferous sulphides will be in all probability effected by the vanners.

Alice and Emma. These claims, Crown grants, Jas. B. McAuley, Spokane, lie immediately west of the "Cariboo," and on one of which is a 63-foot shaft (flooded) down on the vein 7 to $1\frac{1}{2}$ feet wide, of which quartz with a little iron and copper pyrites and blende, which ore is stated to have given fair assay values in gold. The course of the vein is shown by two other openings, but the ground here lies flat and is covered with small timber. No work has been done for several years, or since 1888.

Maple Leaf. Title, Crown grant, Geo. B. McAuley, Spokane. The main vein continues through this property, located 1,056 feet along its course, and lying between the "Emma" and "Eureka." A shaft was sunk 45 feet (flooded) in a bluish-white quartz 4 to 6 feet wide, carrying some iron pyrites.

Eureka. Title, Crown grant, 19.9 acres, Jas. Douglas, Midway. Lying west of the "Maple Leaf," the vein shows up strongly on this claim, and also on the face of the bluff on the "Mammoth" claim next west, and a shaft was started on a vein of white quartz 6 to 7 feet wide, here traversing gneissic and quartzite rocks, but the pitch of the vein flattened a little on the first stope. At 85 feet, a drift was run 125 feet along and in the vein 4 to 6 feet wide. A little lower, one of the flat-dipping faults was struck that threw the ledge a few feet to the south, where, at the bottom of the shaft, it was cross-cut and drifted on for 15 feet, showing 1.5 to 9 feet of white quartz, little mineralized. About 100 feet east, a shaft 15 feet deep was sunk on the same vein, and some very high grade ore was found. A large body of quartz is on this property, some of which has assayed very high in gold, while much has given low returns, but no mill test that would give any idea of the average values has been made. Not worked for several years.

Dolphin. For this claim and the "Shannon," Crown grants are to be applied for by C. A. R. Lambly, Osoyoos, and W. Edwards, Camp McKinney. Lying further west of the "Eureka," three veins are claimed to be on the "Dolphin": (*a*) a quartz vein showing at one place in a shaft $1\frac{1}{2}$ to 3 feet wide, strike N. 60° E.; (*b*) farther west appears to be a band of mineralized quartzose rock, said to give good assays in gold, towards which a tunnel has been run 60 feet through the very quartzose schists; (*c*) near the westerly line of the claim is a vein of quartz with a small amount of pyrites, 3 to 5 feet wide, running N. 70° W., and traceable where it stands up above the surface for about 1,000 feet. No mill tests.

Minnie-ha-ha This claim, 1,500 x 1,500, Crown grant, the "Cariboo Fraction," and the "Golden Crown Fraction," owned by the Minnie-ha-ha Gold Mining Co., Toronto, president, Prof. H. Montgomery, secretary, H. Kitely, Toronto, capital stock, $1,000,000, lie south of the "Cariboo" and "Saw-Tooth" claims, and on the "Minnie-ha-ha" claim a small quartz vein, running parallel with, but nearly 1,500 feet south of the "Cariboo" vein, has been traced for 50 feet on the surface, with a width of 6 inches to 2 feet, the deep wash and timber having so far hidden any further trace of its continuation. A few paces from the west side line a vertical shaft is being sunk on the exposure of the vein, and (June 4th) was 55 feet deep, in which the vein was from a few inches to $4\frac{1}{2}$ feet wide, of a bluish quartz, carrying a little iron pyrites and galena. Faulting, as in the other properties, was being encountered. Good log cabins, bunk houses, eating-house, assay office, etc., had been built, a roadway cut out to the stage road. This company also owns some neighbouring locations, the "Hiawatha," "Medan," and "Kuka." Thirteen men were at work under the superintendence of A. McGraw.

Kamloops. Crown grant, 600 x 1,234 feet; owned by Jas. Moran; lies west of the "Minnie-ha-ha" shaft. A small shaft full of water. Some quartz lying on the dump was seen.

Sailor. To be surveyed for Crown grant; owned by Chas Dietz, Camp McKinney; lies west of "Kamloops" and south of the "Emma" and "Maple Leaf." Some stripping and a small shaft exposed a vein, strike, N. 45° E., 2 to 3 feet wide, carrying in places much sulphides.

Big Bag, 1,500 x 1,500, lying about 1,500 feet south of the "Minnie-ha-ha," owned by A. McGraw and W. H. Norris, Midway, has a small vein running east and west, but no work done.

Saw-Tooth, a fractional claim, owned by A. O'Conners *et al.*, lies south of the "Amelia," and covers the space between that claim and the "Okanagan, has on this spur, in a shaft, an exposure, showing, also on the "Amelia," 3 to 5 feet wide of quartz and sulphides, very similar to the "Cariboo" ore, but lying about 150 feet south of where the "Cariboo" vein is thought to pass.

Okanagan, title Crown grant, 600 x 1,452 feet, owned by S. Mangott *et al.*, lying east of the "Amelia," has a shaft down on a body of quartz, but no work has been done for some years.

Wiarton, surveyed for Crown grant, owned, also some other locations, by a stock company, has had considerable work done, as it lies just east of the "Okanagan," in prospecting for the extension of the "Cariboo" vein, but so far, it is understood, without success, as no quartz was seen at the workings visited.

Fontenoy, Vernon. To be surveyed for Crown grants; owned by Hugh Cameron *et al.*, Camp McKinney, whence the claim lies one-half mile north-east. On the "Fontenoy" a vein running N. 45° W., and dipping N. 45° E. 45° to 55°, in which is white quartz, fragments of country rock, and sulphides, *i. e.*, iron pyrites, galena, and blende, has in one place a shaft or incline 53 feet deep (flooded), from which had been taken a large pile of highly mineralized quartz, much of it massive iron pyrites and galena, said to give good values in gold. In the bottom of the shaft the vein is said to be 5 feet wide. About 600 feet S. E., along the strike, the vein, 2 feet wide, again appears, where the quartz is much honeycombed, carrying coarse-cubed galena, and a shaft was sunk but not far enough to reach the vein. On the "Vernon" a shaft was down 30 feet in a slaty formation, where this same lead was supposed to pass.

Victoria. Title, Crown grant, 600 x 1,500, and the locations, "Queen and "California," 1,500 x 1,500 feet, 3½ miles by road from Camp McKinney, owned by the Rock Creek M. and M. Co., Victoria; managing director, Theo. Lubbe, Victoria; superintendent, C. B. Bash, Camp McKinney.

Rock creek has cut, below a fine waterfall, a narrow gorge, 300 feet deep, and along one bank runs a strongly marked fault plane nearly north and south, with a dip of 60°, above which, for most of the distance, is a heavy bed of bluish quartzite, and below a light green, fine-grained rock, resembling diabasic material, although rather slaty in parts. From the bottom of the gorge, or near the creek level, tunnel No. 2 cross-cuts this greenish rock 205 feet to the fault-wall, down under which, in soft crushed rock-matter, an incline was being sunk (63 feet, June 7th), while an upraise of 145 feet reached a short tunnel 25 feet long, run in the earlier workings to the break. Along under this smooth wall and in this soft material is found a bluish quartz, with iron pyrites and blende, also a little galena, which assays high in gold, the ore being found as if a vein from 2 to 20 inches wide had followed along near the present course of the break, but had since been broken. All this ore is sorted out and sacked or stored, several tons being thus piled up. This tunnel, about 25 feet back from this wall, cut across two small veins of the same character of ore, from 1 to 14 inches wide, dipping towards the wall on a pitch of 45°, and another such was cut 8 feet from the wall.

Tunnel No. 1, 750 feet from and 50 feet above No. 2, runs in 198 feet to the wall, along which 190 feet of drifting has been done, a vein a few inches wide of quartz continuing most of the way. The tunnel continues 36 feet beyond the break through the broken country rock, consisting chiefly of quartzite.

Two other veins are supposed to run through this property, and tunnel No. 1 may be pushed ahead to prospect. All the underground workings are timbered up in good style, and on the flat above are excellent log cabins, bunk-houses, etc., there being a plentiful supply of good timber on these claims. Since visit, a trial shipment of over 25 tons of this sorted ore to a smelter ran 2.15 ounces gold and 5.2 ounces silver, net, per ton.

Old England. This claim, 600 x 1,500, lies next to the "Victoria," and, with the "Homestake," is owned by Nicholson and James. On the "Old England" a large incline-shaft has been sunk 70 feet under the fault-wall and a few feet from the end line, and further along in the claim a cross-cut tunnel was driven without showing up anything. On the other side of the creek a small quartz vein, strike north and south, is being opened up by a tunnel 20 feet, and good assays of gold are got in samples of this ore.

The *Le Roi* and *War Eagle*, 5 miles S. E. of Camp McKinney, and on the old Kettle River trail, were located in 1896 by Jas. Copland and William Yonkin, who have exposed a large body of iron pyrites, pyrrhotite and quartz, with a little chalcopyrite in diabase. A shaft has been sunk 50 feet, with a drift of 20 feet to the east all in these sulphides, the trend and extent of which body are not yet known. This mass of sulphides, of which a considerable dump has accumulated, is said to give fair values in gold, or from traces to $26 by assay.

BURNT GROUND.

This district, to the north-west of Camp McKinney, comprises quartzite with areas of diabase, and probably diorite, in which small irregular veins of white quartz are being located, but the "Bunker Hill" and "Cameronian" could not be found on the day of visit.

Anarchist. The "Anarchist," Crown-granted, 51.65 acres, and the "Dynamite," owned by R. G. Sidley, Sidley P. O., lie about one mile west of the "Cariboo" mine, and close by the main road. Here, in the granite, is a vein, traceable for at least 600 feet, of a very white quartz carrying a very small amount of sulphides as pyrites, zinc blende and galena, with some gold values, but what average values had not been determined. A shaft had been sunk 60 feet, in which were encountered two nearly horizontal faults, along which the vein had been moved the width of itself. Near by are two parallel veins 2 to 4 feet wide traceable for some distance, but not explored. All of these veins run N. 20° E., with a vertical dip.

For water a ditch was being run from the south fork of Rock Creek to bring in 300 inches, which would be available with a head of 250 feet, thus supplying water and power for milling purposes should further work prove this ore of high enough grade to warrant the erection of a stamp mill. There is little or no timber on these claims.

VERNON DIVISION.

The town of *Vernon* is situated in the broad valley in which most of the Yale grain, fruit, and cattle and horse ranches are, but during the past two years much prospecting has been done on the surrounding low-lying hills, that consist of altered sedimentaries, as limestones, quartzites and slates, contorted and compressed by eruptive rocks, such as porphyrites, diorites (?), etc.

Work has been confined mostly to veins of quartz, generally milky-white in colour and very free from sulphides, and while some very nice samples have been found, as yet no shutes of pay-ore can be reported. All of this country is very easy of access, as a saddle-horse may be ridden almost anywhere. The town is beautifully situated on a branch of the C. P. R. from Sycamous, on the main line to Okanagan Lake, on which runs the steamer "Aberdeen" to Penticton, whence run the stage roads to Fairview, Camp McKinney, Greenwood, etc.

MINING PROPERTIES.

The *Morning Glory Mining Co.*, capital stock $500,000; president, E. A. Morden, Vernon, owns the "Sarah," "Morning Glory," "Jumbo," and other claims west of Okanagan Lake, and on the "Sarah," a fractional claim, a small vein of milky-white quartz, with a good amount of sulphides, was being stripped. Some fine samples of free gold are said to have been found on the out-crop, and a tunnel was then in 30 feet along this vein.

On the "Morning Glory" a shaft had been sunk 80 feet on a vein traceable for some distance N. 50° W., of glassy-looking white quartz with very little sulphides, in a greenish granitic rock. No free gold is visible in this large body of quartz at the shaft. It is understood that a 5-stamp mill has since been erected near the lake side, and that this ore has been milled, but not with favourable results. No work is being done at present.

Ruby Gold Mining Co., capital stock $400,000; secretary, Jno. Bond, Vernon. This company has about 14 claims north of the "Morning Glory" and six miles from Vernon, but little or nothing has been done on them during the past season. They lie on the ridge about 600 feet above the lake. "Golden Sunbeam," lying south of the "Sarah," has several very small veins of milky-white quartz in a schistose formation, very free of sulphides, and not traceable for any distance. It is said gold colours can be panned out of the decomposed surface dirt.

Ruby Gold.—A shaft has been sunk 30 feet, starting on a vein of milky-white quartz 10 to 12 feet wide, with some iron pyrites, which towards the bottom breaks up into stringers in the gneissic county rock. It is said free gold has been found in this vein which can be traced for several hundred feet with a very irregular width, and where it crosses the *Close-Call*, it has a wide exposure 12 to 14 feet wide of barren-looking quartz, which can be followed down to the lake side.

STRATHYRE MILL, FAIRVIEW, B. C.

CHINESE PLACER MINING, ROCK CREEK, YALE.

Cartwright.—Southerly from the "Ruby Gold," is another vein, several feet wide for some distance, of white, barren-looking quartz. No work done.

Three Tramps.—Here H. Sidel *et al*, in a dioritic formation, were sinking a shaft to explore some copper-stained, decomposed material, which at time of visit was proving to be a mixed mass of pyrrhotite with a little iron and copper sulphides, of which no assays had been made.

Iron Cap.—Near the lake work was being done by N. P. Nelson *et al*, in a 10-foot hole, where were two narrow veins of sugary white quartz, with a little copper pyrites, but not traceable far.

Bon Diable.—These claims lie on the hills 3.5 miles S. W. of Vernon, and a 35-foot shaft had been started on a 3-foot quartz vein, which narrows quickly in depth, and is cut off by a fault, and a 75-foot drift had not picked up the vein again. Good silver assays are said to have been got from this vein. Higher up this hill a tunnel was being run in an irregular mass of crushed quartz, and on the surface are very large boulders of quartzose rock, probably of quartzite, of which a strong bed lies further up the hill-side.

Swan Lake Group.—These six claims lie east of Swan Lake 3.5 miles from Vernon, and are located on a belt of highly altered but still stratified quartzites, that extends through the country at this point. A small shaft has been sunk, and shallow cut run in, close by the waggon road. In this rock there are no signs of mineralization whatever.

Blue Jay.—This claim, bonded to Mr. A. H. Craven, lies on the top of a hill about 1.5 miles N. W. of Vernon, and on a vein of sugary, yellow white quartz, carrying iron pyrites and mispickel, 3 to 4 feet wide but not traceable for any distance, a shaft was down 25 feet, showing a continuous vein with soft, yellowish gouge along the hanging wall. Good gold values are found in this gangue on the vein, quartz itself is said to give fair assay values. As water was beginning to come in, a cross-cut tunnel of about 120 feet is being driven to tap this ledge. A large exposure of barren-looking quartz in this claim has not been tested.

Chance, and two other claims, owned by T. S. Wolcott, D. G. Skea *et al*, are located on the mountains, about nine miles S. E. from Vernon. The road, passing the Aberdeen Ranch, leads to the foot of the trail ¾ of a mile long that rises 800 feet to where, on the side of the steep hill overlooking a branch of Coldstream Creek, is a large exposure of reddish-white quartz, 6 to 10 feet thick, in a granitic, but decomposed rock. A 25-foot shaft had been sunk on this vein, which can be traced for some distance, but small values in gold, or less than $1 had ever been got. A cross-cut tunnel is now being run to tap this vein at a lower depth, where it will be further explored to see if an ore-shute can be found. There is plenty of water in this creek, 600 feet below.

Camp Hewitt Mining Co., capital stock $1,000,000; Secretary, G. A. Hankey, Vernon. This property of ten claims lying west of the southern end of Okanagan Lake was not visited, as nearly all work had been stopped, and very little was done during the year. Some prospecting has been done on these claims, but very little development work, and only a small amount of ore has so far been uncovered. Of this ore, or quartz with chalcopyrite, two small shipments were made to the smelter at Tacoma, that returned:—

Lot 1.—Gold .1 oz.; silver 13.9 ozs. per ton; copper 11.7 %.
" 2.— " .15 " " 13.8 " " 10.5 %.

More capital is required to carefully explore this ground, as the work so far has not been such as to demonstrate very much, as to the probable ore-bodies or ore-values.

Monashee.—This property on which considerable work has been done to open up a quartz vein, lies about 60 miles by road south-easterly from Vernon, and during the past season was bonded to Captain Molyneaux. Nothing is known to the writer as to whether anything has been or is being done on these claims since the taking up of this bond.

SIMILKAMEEN DIVISION.

BY HUGH HUNTER, MINING RECORDER.

"I have the honour to forward the annual mining statistics for the Similkameen Division, from which you notice that Granite Creek still leads in the output of gold.

"There are some forty leases of mining ground held in this division, and out of that number only four leases have been worked this season, those being held by the Granite Creek Mining Company, situated on Granite Creek. Work was carried on through the whole season with a force of twenty-five men, and only shut down when compelled by frost.

"The Slate Creek Development Company sank a shaft some ninety feet, prospecting for the old channel of Slate Creek, and worked the greater part of the season.

"Considerable prospecting has been done this year for quartz, and over one hundred claims have been recorded.

"On Copper Mountain, which is situated between Wolf Creek and the South Fork of the Similkameen River, much prospecting has been done, and a number of claims located.

"The 'Sunset,' being the best known, is owned by Robert Allen Brown, of Grand Forks, B. C., and the ore assays on an average about sixty (?) per cent. copper, and also carries gold and silver.

"Mr. Brown informs me that he has disposed of a half interest to a Rossland syndicate, and also that a number of claims in the same vicinity have been bonded.

"Free gold has been found on Roche River, which forms one of the forks of the South Fork of the Similkameen River, about thirty miles south of Princeton.

"A number of mineral claims have been located on the Tulameen River. The ore found is principally gold and copper, although at the headwaters large bodies of silver ore have been reported. But as little work has yet been done I am unable to report fully as to its value.

"A trail has been built into this section from Hope, a distance of about thirty miles; and also the trail from Granite Creek has been much improved."

RETURNS FROM MINING RECORDERS.

Mr. C. A. R. Lambly, gold commissioner, has submitted a long and full report, but as the report of the Provincial Mineralogist covers nearly all of this ground, it has not been published, except the following returns from the mining recorders, which show markedly the great increase in the number of locations, transfers, etc., during the past year :—

OSOYOOS DIVISION. JAS. R. BROWN.

	1896.	1897.
Free Miner's Certificates	167	350
Location Records	303	692
Conveyances and Agreements	112	228
Certificates of Work	111	290
" of Improvement	1	24
Permission to Re-locate	3	12
Mining Receipts	$1,572 55	$4,425 67
Free Miner's Certificates	845 00	2,112 00
Total	$2,356 55	$6,537 67

Kettle River Division. Mr. Wm. G. McMynn

	1893.	1894.	1895.	1896.	1897.
Free Miner's Certificates. ...	194	202	457	957	1,050
Location Records........	102	93	771	1,297	1,056
Certificates of Work	66	85	140	566	749
Conveyances	59	55	244	713	749
Certificates of Improvement..	0	3	11	15	16
Mill-site Leases	0	0	3	1	4
Abandonments	6	0	12	35	59
Water Grants	1	3	3	3	1
Permits	0	0	3	9	1
Revenue—					
Mining Receipts	$ 801 55	$ 947 35	$3,153 25	$ 7,240 45	$ 7,376 90
Free Miner's Certificates ...	870 00	1,065 00	2,256 00	4,778 00	6,974 00
Total.	$1,771 55	$2,012 35	$5,409 25	$12,018 45	$14,350 90

Grand Forks Division. Mr. S. R. Almond.

	1897.
Location Records.	430
Certificates of Work	366
Transfers, Agreements, etc	307
Abandonments	22
General Records	3
Certificates of Improvement	2
Free Miner's Certificates	149
Revenue collected—	
Mining Receipts	$3,081 40
Free Miner's Certificates	831 00
Total	$3,912 40

Vernon Division. Mr. J. C. Tunstall.

Location Records.	395
Certificates of Improvement	1
″ of Work	105
Transfers	106
Free Miner's Certificates	382

Similkameen Division. Mr. Hugh Hunter.

Free Miner's Certificates issued	158
Mineral Claims recorded	137
Transfers	33
Certificates of Work issued	46

KAMLOOPS DIVISION.

Near Kamloops, one of the most important tows of the interior, and a divisional point of the C. P. R., considerable interest has been aroused during the past two years by the discovery of copper ore on Coal Hill. Coal Hill lies about three miles south of the town, and consists for the most part of treeless, gently sloping hills with some rock exposures, in which have been found the copper-stained decomposed material capping the copper-impregnated rock beneath. A short visit was made here in September.

Geology. Dr. Dawson, in his geological report on this district, classes the rocks of Coal Hill as the "Plutonic Rocks," which, he writes, "though in all cases intrusive in their relations to the other rocks, vary considerably in character. The larger areas are, however, almost exclusively occupied by gray, granitic rocks of different types, but between which no distinct lines can generally be drawn. Syenites occur in some places, and on Kamloops Lake and westward along the Thompson valley considerable areas of gabbro, closely associated with the granites, are included under the same colour. The chief granitic intrusions have occurred about the close of the Triassic period, but some later granites are found cutting through Cretaceous rocks." (*See* explanatory notes, Kamloops sheet).

Ore and Ore Deposits. In this granitoid or gabbro mass of Coal Hill run, in various directions, fractures along which are found the gabbro more or less impregnated with chalcopyrite, magnetite, iron pyrites, etc., in which material are some gold and silver values. Not much work has been done on any of the many locations, but on the "Iron Mask" quite a shute of copper pyrites and magnetite has been found, while on the "Lucky Strike" a good body of solid chalcopyrite was uncovered.

So far, all the "showings" have proved to be not large, and to carry no high values in gold and silver, but should more extended work, which is much needed here, prove up ore-shutes of size and better values, the facilities for easy mining and transportation will be excellent.

About all the work in progress is that being done on the "Lucky Strike," and this will serve, to some extent, to demonstrate the conditions existing here. Litigation has stopped advance on the "Iron Mask," and the work on many of the other claims has proved up very little or nothing, as yet.

MINING CLAIMS.

Iron Mask. After running a short cross-cut, a drift runs for 60 feet along a ledge of magnetite and copper pyrites in the decomposed gabbro. The vein of solid material varies in width from 3 to 18 inches, but the ledge is wider. By open cuts this ledge can be traced for a considerable distance, but all work has been stopped for some time.

Erin. On this claim, owned by Mr. Beattie, *et al*, supposed to be the northern extension of the "Iron Mask," some work was showing up a large amount of gossany material, in which were some copper sulphides. Assays of this material had run as high as $18 in gold, but work had not proceeded far enough to reach the unaltered mass. The "Bonnie Etta," "Jubilee" and "Norma" show some copper-stained rock, and in a 40-foot shaft on the "Jubilee," some solid copper pryites were found in the bottom.

Lucky Strike. This fractional claim was bought by Mr. Jno. Cobeldick for $5,500, who has also bonded the surrounding claims. Out on the open, flat copper-stained rock led to a little work being done that exposed a mineralized zone traceable for some distance, where at one point about 6 feet of nearly solid copper pyrites were stripped. Here a shaft was being sunk (20 feet deep, Sept. 30th), in which this ore-body was seen to break up into irregular stringers. Open cuts were being dug to trace the continuation of this lead, while about 8 tons of clean copper ore had been sorted and sacked. This ore carries some gold values, but how much was not ascertained. Work is still in progress at this shaft.

Iron Cap. On this claim, one mile south-west of the "Iron Mask," a 70-foot inclined shaft had been sunk, in which some mixed ore or rock, impregnated with copper and iron pryites, had been found, or material assaying from $6 to $10 in gold.

No work was being done here. Mr. Tunstall reports that "five tons sent to Everett smelter returned $58 in gold and copper."

Bonanza. One and a half miles south-west of "Iron Cap," owned by Wm. Ford, A. Darby *et al.* A shaft had been sunk 53 feet and a cross-cut run 60 feet where the gabbro was impregnated with a very small amount of copper sulphides, carrying small gold values. On the next claim, the "Pot Hook," was found copper stained surface rock. No work was being done here.

Copper King. This, and two other claims owned J. H. Hill *et al.*, are located 1.5 miles south of the Glen Iron mines, and near Mr. Roper's ranch, in a small area of gabbro. Here a 25-foot shaft had been sunk along a narrow vein of mixed ore, carrying bornite and chalcopyrite, reported to assay well in silver and gold. About 3 tons of this mixed ore was on the dump, but very little was in sight in the shaft.

Python. This and some other claims, owned by W. F. Wood *et al.*, the first location on Coal Hill. A shaft has been sunk 80 feet, following narrow stringers of copper pyrites and magnetite that ramify irregularly through the mass of rock, itself also slightly impregnated with these minerals. Several tons of very mixed ore were on the dump, but no body of ore had been exposed. This ore carries some gold and silver, but how much was not learned. No work was being done.

Jacko Lake. Several claims in the vicinity of this lake were visited, but very little could be seen, except on some claims some copper-stained rock, but no solid copper sulphides.

REPORT BY MR. G. C. TUNSTALL,

Gold Commissioner, Kamloops.

The following report for 1897 by the Gold Commissioner is here appended :—

KAMLOOPS DIVISION.

Placer Mines. "Very little placer mining has been done the past year. A few Chinese still manage to make small wages on Tranquille and Scotch Creeks.

"The Thompson River Hydraulic Mining Co.'s property has lain idle, pending negotiations for its sale. The mining leasehold acquired by Mr. J. H. Russell was worked for a short time, but the depth of ground has increased to so great an extent that the adoption of the hydraulic process will be necessary to make it profitable.

"North Thompson River.

Mineral Claims. "Considerable prospecting was done the past summer along this river and its tributaries, resulting in some good prospects being found. No assessment work has yet been recorded, therefore little is known of their value.

"Jameson Creek.

"This creek, favourably reported on by Dr. Dawson some years ago, empties into the North Thompson River on the west side, about 12 miles above Kamloops. Some 10 or 12 locations have been recorded. The quartz lodes, six in number, exist in a granite formation, and run parallel to each other. Assays average from $5 to $36 in gold. These claims are accessible, and possess an unlimited supply of wood and water.

"Dixon Creek.

"Very fine copper and silver ore has been found on this creek, where work is being done. A tunnel has been run in one of the locations for 35 feet on the ore-body of clean smelting ore, carrying pay values in gold and silver.

"SKULL CREEK.

"On this creek, situated about 20 miles above Jameson Creek, several claims have been recorded. They lie in a belt of country much contorted and completely mineralized with pyrites.

"MANSON CREEK.

"Manson Creek is on the divide leading to Shuswap Lake. Two claims have been recorded, the 'Manson' and 'Imperial.' The ledge is from 2 to 6 feet in width, from which 700 pounds of picked ore were shipped for a smelter test, with a return of 500 ounces silver, $4 in gold, 7 per cent. lead, and 10 per cent. copper to the ton.

"BIG SHUSWAP LAKE.

Blue Bird.—This was probably the most important discovery made the past year in the Kamloops Division. It is attracting wide-spread attention through a report made by Mr. T. Newman, and printed by the owners for circulation. The location is about four miles north of Sicamous and close to the lake. The vein is 50 feet wide, and is visible in the face of a steep bluff with a surface exposure of not less than 3,000 feet in length. The ledge matter, reported to be solid ore, resembles that in the best Rossland mines. The assay made averaged $29.32 in gold to the ton, and as high as $698 in gold, besides copper, has been obtained in assays of choice samples. Transportation can be effected by water to the C. P. R., a distance of four miles, at a trifling cost.

"KAMLOOPS LAKE.

Glen Iron Mines.—"The Glen Iron Mining Co. has exported during the past year 2,000 tons of iron ore for fluxing purposes, to the Everett smelter, Everett, Wash., and another contract for 500 tons is expected to be filled in the spring.

"COPPER CREEK.

"Besides the usual assessment work there has been no development done since last May. Good offers to bond these copper claims have been refused, which would now be accepted.

"The claim-owners, not in possession of sufficient means to develop their properties, are waiting for purchasers to acquire their rights.

"THE CINNABAR MINING CO.

"The furnace belonging to this company was started the latter part of March, but only ran for a short time, as it was seen that some alterations would have to be made before the ore could be treated successfully, the results not being satisfactory.

"The prospecting of the deep ground with a diamond drill before commencing some tunnels, cross-cuts and winzes in the 'Blue Bird' and 'Rosebush' claims, was contemplated, but for some reason this work has not been accomplished. The Cariboo Gold Fields Co. has completed assessment work on a number of cinnabar claims on the north side of Kamloops Lake, but more labour will be required to determine their value.

"HARDIE MOUNTAIN.

"Assessment work was done on the 'Idria,' 'Almaden' and others. The 'Columbia' has a tunnel 145 feet long, with fairly good furnace ore in the face, running from 1 to 2 per cent. mercury at a depth of 110 feet from the surface, showing conclusively that the ore extends downward that distance from the surface. Upon the completion of 100 feet more of tunneling, cross-cuts will be made to thoroughly test the body of mineral. These works have succeeded in draining the surface water of the 'Idria' and 'Almaden' mines, and will permit the sinking of shafts on these properties without any difficulty from water.

"CHRIS AND DEADMAN CREEKS.

"The Cariboo Gold Fields Co. own a number of cinnabar claims on these creeks. The broken up and irregular formation of this section of the country has prevented any well defined body of ore being found without the expenditure of a considerable amount of money. Richard Williams and others have done some superficial work on cinnabar locations on Chris Creek, with satisfactory results. Indications point to the existence of good bodies of ore in the vicinity. A number of quartz locations have also been taken up, containing gold, but the ore is of a low grade character.

"MAMMETTE LAKE.

"Mammette Lake, about thirty miles south of Savona, is connected with an excellent road running from Savona into the Nicola Valley. In the vicinity of the lake Messrs. Dupont, Wilson, Ferguson and others have located a number of copper claims. The ore found in a porphyry dyke, is an iron oxide carrying, it is said, from 12 to 33 per cent. copper, and a small quantity of gold. The surface is badly broken up, and no well-defined vein has yet been discovered. The mineral is found cropping out on the surface in large, isolated bodies, varying in width from 4 to 20 feet. A tunnel has been run in on the 'Eagle Boy' a distance of 60 feet without finding vein matter. The rich assays obtained, and the knowledge that an extensive deposit must exist close by to their works, have encouraged the proprietors to steadily persevere in carrying on their operations.

"STUMP LAKE.

"The silver mines at Stump Lake again attracted attention during the past year. Some of the old claims, whose titles had expired, have been re-located, whilst new discoveries have been staked off and recorded.

"QUILCHENA.

"The country around Quilchena was prospected to a limited extent, and several claims taken up. The croppings contain copper and gold assaying sufficiently well to warrant further exploration.

"NICOLA LAKE.

"Several very promising claims have been located within a radius of several miles of this lake, a few of which may shortly be bonded, which is certain to give an impetus to mining in this district. About one mile east from the town and 300 yards from the waggon road a large deposit of iron (in a species of limestone) was discovered, running in a south-easterly direction for several miles, upon which many locations have been staked.

"On one of the locations, the 'Triumph,' an open cut 16 feet long and 10 feet deep has been made. Various assays from the carbonate ore range from nil to $84 in gold to the ton.

"CLAPPERTON ON MILL CREEK.

Peacock. "On the above claim a large deposit of mineralized quartz was discovered the past summer, containing principally peacock copper ore. Much of the ledge matter assays $5 in gold and $15 and more in copper to the ton. The 'Boulder Cap,' an extension of the above, upon which work was commenced last fall, showed at a depth of ten feet a similar deposit. There are in all some twelve claims located, a few of these having very fair surface indications, but having been staked at a later date very little is known of their value.

"Several bodies of carbonate ore have been discovered in the vicinity of Nicola Lake, and some few weeks since fine specimens of metallic copper ore were brought in from about ten miles north of the lake, the vein matter showing up through a granite formation. Assessment work has been done on most of the claims in this vicinity. The principal locations adjoining the waggon road are the 'Jupiter' and 'Victoria' which show chalcopyrite containing gold in a limestone formation.

"Five miles across the valley in a south-easterly direction from the group last-mentioned, two claims were staked last year, the 'Toronto' and 'Halton,' that have an iron-capping beneath which some rich ore was discovered carrying gold and silver.

YALE DIVISION.

"Less industrial mining was carried on in this Division than in 1896, but other branches of mining are assuming more importance.

River Dredging.

"The history of river dredging on the Fraser and other rivers in the Province, has been associated with failure since the first introduction of machinery designed for that purpose. The promoters were persons without any mining experience, entirely ignorant of the obstacles to be overcome, and of the best means to avoid them. These devices, which excited the amazement of the old miners, most of whose lives had been spent in mining on the Fraser, but whose advice was deemed unworthy of notice, consisted principally of powerful centrifugal pumps supposed to be able to suck up the auriferous gravel from the bottom without the slightest difficulty, but in practice they, unfortunately, brought up stones with greater facility, which constantly choked the pipes and caused many delays.

"There were also other devices constructed of a more impracticable nature, which only betrayed the little knowledge possessed by their inventors of the work they had to accomplish. It is therefore pleasing to note the comparative success attending the operations of the Beatty Gold Mining and Dredging Co., which are still in progress below North Bend, on Boston Bar. The dredge referred to is provided with a shovel or dipper under perfect control of the machinery, capable of being swung around and submerged anywhere within a certain radius, and with a capacity at each hoist of 1½ tons of gravel in less than one minute. The amount of material raised per diem is estimated at 800 cubic yards, and this is deposited on an incline iron grating, or 'grizzly,' lying on a scow moored alongside by which the large rocks are deposited in the river, while the smaller stones and gravel are carried into a dump-box placed underneath, and run thence into sluice boxes furnished with different kinds of plates, riffles and undercurrents, supplied with quicksilver to save the fine gold.

"The shovel raises a certain amount of water, but not sufficient to run off the gravel, and a further supply for washing is provided by means of a dump. The gold is found beneath a layer of boulders lying at or near the surface of the river bottom. Difficulty is frequently encountered in moving the scow by reason of the large rocks precipitated from the 'grizzly,' forming a bar in a comparatively short time, but measures will be taken to avoid this obstacle in future. The machinery is capable of working to a depth of 26 feet.

"As no coarse gold has been obtained, I would infer that operations did not extend as far as the bedrock, where it should be found in large quantities in the crevices and seams, under conditions which may probably render its recovery a difficult matter. The mining season is confined to the period of low water. Work began on the 30th August last, and has continued with some interruptions to the present date, and will be carried on through the winter, provided no severe frost intervenes. The shareholders are so well satisfied with the returns obtained, $7,000, that it is the intention to construct several more dredges of the same description to work on the various stretches of the river they now hold under lease. The cost of this dredge was $18,000, and seven men are employed.

Hydraulic Mining.

"The past season was not a favourable one for hydraulic mining, owing to a short water supply. The early part of the summer was hot, and no rain fell from the month of June until September.

"THE OTTAWA HYDRAULIC MINING AND MILLING CO.

"The most extensive mining enterprise operating on the banks of the Fraser, about one half mile below North Bend, did some work in 1896, but commenced late in the past season in consequence of necessary repairs to the flume, and the scarcity of water at the end of August, which was totally insufficient to supply the two monitors. Very fair results were, however, obtained from the wash-ups made.

"The Agnes Hydraulic Mining Co.'s property is located near North Bend, on the right bank of the Fraser River, and extends from the railway track to the water's edge. The greater part of the summer was spent bringing the water in a flume from two creeks, a distance of one and one half miles, so that very little ground was washed.

"Ashcroft Gold mining Co.—This mining leasehold lies about one mile below Keefers, and consisists of a bench adjoining the railway track. The summer was spent in constructing a ditch and flume. The pipes have been laid in position and everything is in readiness for work when the spring opens. The ground, I understand, prospects very well, and is considered one of the best locations on the Fraser.

Gold Yield.

"The following is the yield of gold for the past year, also revenue from mining receipts:

Hope	$ 800
Yale	11,600
Spuzzum	3,172
North Bend	3,231
Keefers	1,500
Lytton	16,369
Spence's Bridge	700
Ashcroft	6,000
Ottawa Hydraulic Mining Co	2,000
Agnes Hydraulic Mining Co	300
Beatty Gold Mining and Dredging Co	7,000
Taken away in private hands	5,000
Grand total	$58,675

"MINERAL CLAIMS.

Queen.—This Company has been engaged developing their property the past season by extending the tunnel 150 feet to strike the ledge. One and one half miles of road have been constructed.

"SIWASH CREEK.

"The claims on this creek have only had assessment work performed on them.

"SALMON RIVER.

"Allan, Grisby & Co. have been engaged driving a tunnel in their location with encouraging prospects.

"SUMMIT CAMP (near Hope).

"Murphy & Co. are said to have discovered rich and extensive bodies of galena ore, and they intend to push work vigorously this year.

"THOMPSON RIVER.

"In the neighbourhood of Lytton a large number of mineral claims have been staked. Excellent assays have been obtained from the ore, which chiefly contains gold. Some development work has been accomplished, but not enough to determine the value of the locations.

"The 'Faith' claim has been bonded by Mr. John Francis. It is situated along the Thompson River, and a tunnel has been driven 70 feet. The rock, from which some very rich assays have been obtained, being reported free milling.

"'Lily May,' two miles east of the 'Faith,' is a copper proposition, and a tunnel has been driven 90 feet, showing some good ore."

MINING MACHINERY.

The following list of mining machinery installed at the various mines in the Province, and the list is not complete, will afford some idea of the progress made during the past four years. With the exception of the "Le Roi" and "War Eagle," no very large plants have yet been erected, but it will be seen that there is now a comparatively large number of properties equipped for development and mining.

Both the Rand and Ingersoll-Sergeant Companies have manufactories established in Canada, which have supplied most of their machinery in this list. The Jenckes Machine Company has its works at Sherbrooke, Que. At Vancouver, the B. C. Iron Works Co., Ltd., have recently greatly enlarged their works for the special manufacture of mining machinery, which is also constructed in Victoria at the Albion Iron Works. At Peterboro, Ont., the Wm. Hamilton Man. Co., Ltd., are under licence from the Edward P. Allis Co., of Milwaukee.

For the details of the list below, the writer is indebted to J. D. Sword, agent for the Ingersoll-Sergeant Drill Co., and T. R. Mendenhall, Rand Drill Co., Rossland.

The total estimated values by this list amount to $750,000.

ROSSLAND.

Le Roi.—One 40-drill cross Corliss and one 5-drill Rand compressors; three 125-h.p. and one 100-h.p. Ingersoll boilers; one 80-h.p. and one 40-h.p. Fraser and Chalmers boilers; 15 Rand and 17 Ingersoll-Sergeant drills; one large 300-h.p. direct acting winding engine, made by Ingersoll Drill Co., and 3 small hoisting engines; sinking pumps; electric light plant, including one 40-h.p. Westinghouse engine; machine saw for framing timbers, etc. Total cost, $70,000.

War Eagle.—One 20-drill cross Corliss Rand air compressor; two 100-h.p. Ingersoll boilers; one geared hoisting engine, Fraser and Chalmers; 3 Rand and 13 Ingersoll-Sergeant drills; one Knowles and one Cameron sinking pump, etc. Total cost, $30,000.

Columbia-Kootenay.—One 30-drill Corliss Ingersoll-Sergeant compressor; three 100-h.p. boilers; one 10 by 12 hoisting engine; 7 Rand drills. Total cost, $28,000.

Josie.—One 5-drill Ingersoll-Sergeant compressor; one 60-h.p. boiler; 7 Ingersoll drills; one 8 by 10 hoisting engine; one Northey sinking pump. Total cost, $10,000.

Rossland-Red Mountain.—The Jenckes Machine Co. and Rand Drill Co. supplied one 5-drill compressor; 3 drills and one 60-h.p. boiler. Cost, set up, $6,000.

Centre Star.—One 7-drill compressor, and one 80-h.p. boiler, Ingersoll Co.; 2 Ingersoll, and 3 Rand drills; one small hoisting engine. Cost, set up, $8,000.

O. K.—One 10-stamp mill (Jenckes Machine Co.); one 4-drill Rand compressor with drills. Cost, set up, $17,000.

Nickel Plate.—One small boiler; 1 hoisting engine; 1 Knowles' sinking pump. Cost, $4,500.

Iron Mask.—One 10 by 14 hoisting engine, Fraser & Chalmers; 3 Ingersoll-Sergeant drills; one sinking pump. Cost, $4,500.

Great Western.—One 6 by 8 hoisting engine (Jenckes); one 30-h.p. boiler; 2 Rand drills; Northey sinking pump. Cost, $4,000.

Monte Cristo.—One 7-drill, Ingersoll, and one 3-drill Rand air compressor; one 80-h.p. boiler; 8 Ingersoll drills; receiver, pipe-line, etc. Cost, $9,000.

Virginia.—One 6 by 8 hoisting engine (Jenckes); 2 Rand drills; air receiver, etc. Cost, $3,500.

Iron Colt.—One 4-drill Ingersoll air compressor; one 40-h.p. boiler; 2 Rand and one Ingersoll drills. Cost, $5,000.

Cliff.—One 2-drill Rand compressor; one 50-h.p. boiler; 2 Rand drills. Cost, $3,500.

City of Spokane.—One 4-drill Rand compressor; one 50-h.p. boiler; 2 Abner Doble drills. Cost, $5,000.

Lily May.—One 4-drill Ingersoll compressor; one 60-h-p. boiler; one 6 by 8 hoisting engine; 2 Ingersoll drills. Cost, $6,000.

Commander.—One Ingersoll vertical boiler and hoisting engine; one Rand drill. Cost, $3,500.

Homestake.—One 5-drill Ingersoll compressor; one 80-h. p. boiler; one 8x10 hoisting engine; one sinking pump; 5 Ingersoll drills. Cost, $10,000.

Crown Point.—One 4-drill Rand compressor; one 60-h. p. boiler; 3 Rand drills; receiver, etc. Cost, $6,000.

Deer Park.—One 50-h. p. boiler; one 30-h. p. hoisting engine; one Northey sinking pump. Supplied by Ingersoll-Sergeant Drill Co. Cost, $4,500.

Sunset No. 2.—One 7-drill Ingersoll compressor; one 80-h. p. boiler; one 30-h. p. hoisting engine; one sinking pump; 4 Ingersoll drills. Cost, $14,000.

Mayflower.—One 30-h. p. hoisting engine and boiler. Cost, $3,000.

Nest Egg.—One 4-drill compressor; one 60-h. p. boiler; 3 drills; all supplied by Rand Drill Co., but since removed. Cost, $5,500.

Blue Bell.—One 25-h. p. boiler and small hoisting engine; one Rand drill. Cost, $2,000.

Robert E. Lee.—One 7-drill air compressor; one 100-h.p. boiler; one 30-h.p. hoisting engine; 6 drills; one sinking pump, etc.; all supplied by Ingersoll-Sergeant Drill Co. Cost, $12,000.

Silver Bell.—One vertical boiler with hoist (Jenckes). Cost, $2,500.

Velvet.—One 30-h.p. boiler, hoisting engine, etc. Cost, $3,000.

Nelson District.

Hall Mines.—(At mine) two 10- and one 4-drill Ingersoll compressors; five Ingersoll boilers—three 60-h.p., one 80-h.p., and one 40-h.p.; one 16x36 Corliss engine; 22 Ingersoll-Sergeant drills; rock crusher; two hoisting engines; two Sullivan diamond drills; air receivers, pipe lines, machine shop, etc. Cost (exclusive of aerial tramway and smelter), $50,000.

Poorman.—One 10-stamp mill; one 3-drill Rand compressor; one 20-h.p. hoisting engine and boiler; two Rand drills. Cost, 16,000.

Fern.—10-stamp mill; 3-rail gravity tramway. Cost, $33,000.

Dundee.—One 30-h.p. boiler and hoist; two Ingersoll drills; one Northey sinking pump. Cost, $5,000.

Slocan District.

Slocan Star.—One 120-ton concentrator, machinery from E. P. Allis Co.; one 4-drill Rand compressor; two 50-h.p. boilers; two Rand and one Ingersoll drills. Cost, $40,000.

Galena Farm.—One 6-drill Rand compressor; one 40-h.p. boiler; three Rand drills; one large water-power hoisting engine, Pelton wheel, etc.; three sinking pumps—one Northey, one Cameron, 1 Knowles. Cost, $15,000.

Dardanelles.—One 3-drill Rand compressor; one 40-h.p. boiler; two Rand drills. Cost, $5,000.

Antoine.—One 20-h.p. boiler and hoisting engine; one small sinking pump. Cost, $3,000.

Lucky Jim.—One Rand 3-drill compressor, with two drills; one 40-h.p. boiler. Cost, $5,000.

Noble Five.—One 120-ton concentrator (E. P. Allis Co.); one Finlayson aerial tramway (Colorado Iron Works, Denver). Cost, $60,000.

Washington.—One 40-ton concentrator (Jenckes). Cost, $10,000.

Ruth.—One Ingersoll 5-drill compressor, with 6 drills; one 80.h.p. boiler (Robb); one saw mill, with 10x16 engine (Wm. Hamilton Co.). Cost, $12,000.

Alamo.—One 75-ton concentrator, with Pelton wheel; 3-rail tramway. Cost, $35,000.

Ainsworth District.

Highlander.—One Jenckes hoisting engine and boiler. Cost, $3,500.

No. One.—Concentrator.

Canadian Pacific M. & M. Co.—One 50-ton concentrator; one 10-drill Ingersoll drill, with 4 drills, Pelton wheel, etc. Cost, $11,000.

Montezuma—One 100-ton concentrator and aerial tramway; one 2-drill Rand compressor with one drill, operated by Pelton wheel.

Blue Belle.—One 12-inch Allis air compressor; one 50-h.p. boiler; two Rand and two Ingersoll drills. Cost, $6,000.

Boundary Creek.

B. C.—One 3-drill Rand compressor and drills; one 40-h.p. boiler (Jenckes). Cost, $5,000.

Winnipeg.—One small vertical boiler and hoisting engine (Jenckes). Cost, $2,000.

Golden Crown.—One 50-h.p. boiler; one 30-h.p. hoisting engine; one Knowles sinking pump. Cost, $2,500.

Jewel.—Vertical boiler and hoisting engine; sinking pump. Cost, $2,000.

Other Districts.

Tinhorn, Fairview. Stamp-mill, &c. Cost, $33,000.

Cariboo, Camp McKinney.—Stamp-mill, hoisting engine, compressor, &c. Cost, $32,000.

Lanark, Illecillewaet.—Concentrator, Otto tramway, electric plant, &c. Cost, $70,000.

Golden Cache, Lillooet.—10-stamp mill and 3-rail gravity tramway. Cost, $20,000.

COAL MINES.

By A. Dick, Inspector of Coal Mines.

"The collieries in operation during the past year, 1897, were:—

"The Nanaimo Colliery of the New Vancouver Coal Mining & Land Company, Limited.
"Wellington Colliery, owned by Messrs. R. Dunsmuir & Sons.
"Union Colliery, of the Union Colliery Company.
"The Wellington Colliery Company's Mines, Alexandra Mines, and West Wellington Colliery, owned by the West Wellington Coal Company, Limited.

"The output of coal for 1897 amounted to $892,295\frac{19}{20}$ tons, produced by the several collieries as follows:—

	Tons.
" Nanaimo Colliery	$319,343\frac{14}{20}$
Wellington Colliery	$297,611\frac{15}{20}$
Union Colliery	265,642
Wellington Colliery Company's Mines	6,000
Alexandria Mine	3,375
West Wellington Colliery	$323\frac{10}{20}$
* Total output for the year 1897	$892,295\frac{19}{20}$
Add coal on hand at 1st January, 1897	$48,111\frac{13}{20}$
Total coal for disposal	$940,407\frac{12}{20}$

"The export of coal by the collieries for 1897 was as follows:—

" Nanaimo Colliery	$231,986\frac{10}{20}$
Wellington Colliery	$211,662\frac{5}{20}$
Union Colliery	176,212
Total coal exported in 1897	$619,860\frac{15}{20}$
Home consumption	$290,309\frac{10}{20}$
Coal on hand 1st January, 1898	$30,237\frac{7}{20}$

"The returns for the year show a home consumption of coal amounting to $290,309\frac{10}{20}$ tons as against $261,983\frac{12}{20}$ tons last year (1896). It must, however, be noted, that the coal used in and about the colleries is, in most instances, under this heading.

Coke. "In addition to the stated home consumption of coal for 1897, we consumed in British Columbia 14,528.5 tons of coke, and exported 2,573 tons to California, U. S., leaving 730 tons on hand on 1st January, 1898, being a total of 17,831.5 tons, all of which was manufactured at Union Colliery, Comox. In connection with this colliery there are one hundred ovens of the bee hive pattern, which are all at work turning out a first-class coke, for which there is a good market both in British Columbia and in San Francisco, and also wherever it has been tried. Now the Union Colliery company is building a second hundred ovens for the coke-making business; these are on the same pattern as the first, and are all expected to be in operation early in the summer. The company will be in a position to fill orders that they have now to refuse. The time has arrived when it is not necessary to send out of the country for a first-class coke, this being now manufactured in British Columbia, and equal to any that can be imported.

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* This total is more than the amount telegraphed by Mr. Dick, February 7th, and embodied in the foregoing tables, pp. 455-457. W. A. C.

Fire Clay. "There is yet another first-class article that is the product of our mines that I will mention here—that is a fire-clay, of which the output for the past year was 1,628.7 tons, all of which was sold—the greater part of it made into brick, which are now being built into the ovens now under construction by the Union Colliery Company.

Coal. "The coal exported was shipped at the ports of Nanaimo, Departure Bay, and Union (near Comox), Vancouver Island, in British Columbia. The exports were principally made to San Francisco, San Pedro and San Diego, in California, U. S. A. Shipments were also made to the States of Oregon and Washington, to Alaska and Petropauloski, and Hawaiian Islands, and there was one shipment made to Central America.

"In order to show the standing of the British Columbia Coal in the California market, I append the following return for the year 1897:—

"Coal Imported into California, 1897.

		Tons.
"British Columbia coal		558,372
Australia	"	281,666
English	"	107,969
Scotch	"	4,081
Eastern	"	21,335
Seattle	"	220,175
Carbon Hill	"	286,205
Diabolo, Coos Bay	"	115,150
Japan, Alaska, etc.	"	6,587
Total		1,601,540

"The total deliveries of coke in San Francisco this year amounted to 30,320 tons, of which the Union Colliery Company, British Columbia, gave 2,573 tons, and 1,889 tons came from Australia. Now that we have made our first year's shipments of coke—a first-class article, all those who have used it being well satisfied with its quality, and the coke being in great demand by those who have used it—doubtless the Union Colliery Company will be making regular shipments to the California market henceforth.

NANAIMO COLLIERY.

"This colliery is owned and worked by 'The New Vancouver Coal Mining and Land Company, Ltd.,' whose head offices are in London, England.

"No. 1 Shaft (Esplanade), Nanaimo City.

"I have, in a former report, already explained that this shaft is situated within the corporate limits of Nanaimo City. It may be said to be the most extensive mine in this district, and to have its working face at a further distance from the bottom of the shaft than any other mine in the Dominion of Canada. By steady and progressive working, the face is now fully three miles from the bottom of the shaft, and at present no limit can be placed at the distance to which it may not in time be extended. With the exception of a small area around the bottom of the shaft, all of the workings of this extensive mine are situated beneath the waters of Nanaimo Harbour, the surface of Protection (or Douglas) Island and Newcastle Island. The workings are likewise being extended deeply below ground, under the Gulf of Georgia, from the north side of Newcastle Island, and at present most of the working faces are under the last-mentioned island. As to their condition, I might say that they are dry, but not dusty, and are quite safe from any influx of water from above, there being a thickness of rock and débris varying from 150 to 1,600 feet between the bed of the harbour and the workings of the mine. All of the workings of this mine have been carried on on the pillar and stall as well as on the panel system. Fully two-thirds of the coal are left in pillars of large dimensions to support the heavy pressure from above, with the full knowledge that they can be removed at some future time after they have served their present useful purpose. In two or three places, where the removal of the pillars could do no harm, and where their retention served no purpose, they have begun to take them out, and so far with good results.

"No. 1, North Level.

"In some of my previous reports I have given a very full description of this level, which is undoubtedly the longest hauling road in this district. The coal found within its workings has been very good, and has varied in thickness from 3 to 10 feet. At the face the roof is generally good. Though the coal has been good, the mine itself has not been without its faults, and has at times given the management much trouble. With the exception of the pillar coal taken out of Nos. 2 and 3 levels, all of the coal taken from No. 1 shaft comes from the No. 1 level.

"The Slope.

"In addition to the levels above mentioned, there is a slope, which branches off from the No. 1 level at about 50 yards from the shaft, and runs in a northerly direction. This slope is now down 2,100 yards, and lies 1,600 feet vertically, beneath tide water. This slope has run through much faulted ground, and the coal is not extra good in the face at present.

"Ventilation.

"The workings of this extensive mine are ventilated by a large 'Guibal' fan, 36 feet in diameter by 12 feet wide, driven by a large steam engine, running at a speed of 46 revolutions per minute, and keeping the air current in motion at the rate of 102,000 cubic feet per minute, with a water-gauge standing at one and nine-tenths.

"This mine is ventilated on the separate-split system, and the air supply is distributed as follows:—

"To main slope......	35,000	cub. ft.	per min.	for men about shaft and stable.
" No. 1 incline....	21,000	"	"	66 men.
" pillars in incline.	5,680	"	"	21 "
" No. 2 incline....	13,000	"	"	56 "
" pillars in No. 2 and No. 3 levels....	27,320	"	"	40 "

"In addition to supplying the foregoing number of men with the requisite air, there are also 20 mules scattered about in different parts of the workings, who also draw on the above ventilation. It must be borne in mind that these men and mules are those employed on one shift only. The intake to this fan shaft is the Protection Island shaft, with which it is connected beneath the waters of the harbour. At this part of my Report, it may not be out of place to mention that the New Vancouver Coal Company have for the past five years been hauling the coal out of the levels with the aid of electricity, and so far with great success. The plant was supplied and fitted up by the Edison General Electric Co. The dynamos, (driven by a steam engine) being situated above ground, about 100 feet from the mouth of No. 1 shaft. From the dynamos the current is carried down the No. 1 shaft, and thence distributed wherever it is required. The wires are insulated at all places where from their position they might prove dangerous to the men or animals. For hauling purposes the wires are strung for a distance of two miles, which represents the haulage done by the locomotives. To do the work the company purchased four electric locomotives, one small motor of 15-horse power, and three of 30-horse power, of 8 tons each. They work easily, and are well under control, and come up in every way to the expectations of the company. Their usual rate of travelling is about 8 miles an hour and not unusually with a load of 60 or 70 tons net behind them. In addition to the hauling of coal, the dynamos also supply the bottom of the shaft, sidings, and engine houses with light in the form of the electric spark.

"Protection Island Shaft.

"This shaft is also the property of the same company, and is situated on the south point of Protection (or Douglas) Island. The workings of this mine are now from the slope on both the north and south sides of the shaft. The slope on the south side going due east is down 1,700 yards, lying 1,740 feet (vertically) below the surface of the water, at the entrance to

Nanaimo harbour. The slope on the north side is down 1,490 yards in a north easterly direction, and at that distance is 1,200 feet below the surface of the tidal water of Northumberland Channel. This mine was worked from the 1st January, last, to the 31st July, when the condition of the coal trade would not justify the company in keeping it open any longer, as what demand there was could be met by the output from the other mine. It was, therefore, temporarily shut down, throwing fully 200 men out of employment The company put to work as many of these men as they could find openings for, in No. 1 mine; but there are still a large number out of work. It is the intention of the management, just as soon as the condition of the coal trade justifies it, to re-open this mine, when it will only take a few days to put it in running order again.

"Ventilation.

"The ventilation was good up to the time of inspection, and although there are not any miners at work, the air current is still kept through the mine.

"No. 5 Shaft (Nanaimo Colliery).

"This mine, which likewise belongs to the New Vancouver Coal Co., is what is known as the Southfield Mine, being in the southern part of their large estate. The workings from this shaft are all to the eastward, and are on the pillar and stall system. The management have been much troubled with faults of one kind and another, and have not as yet got clear of them, although during the past year there has been much improvement in the coal. The coal mined here is of a very good quality, and in some places is twenty-two feet thick.

"This mine is worked and ventilated in two different districts, known as the East Level and East Incline Divisions. In the East Level all the mining is done in the extraction of pillars (coal), which are large and generally thick, so the product is generally good large coal. In the East Incline all of the mining is on the pillar and stall system, leaving the pillars to support the roof. Eventually when they are no longer required they will be taken out.

"Ventilation.

"The ventilation is good, the motive power being a double fan worked by a steam engine. When I was down in December there were 47,320 cubic feet of air travelling through the works per minute, supplying ventilation for 64 men and 5 mules. It was divided as follows:

To East Level —30,000 cubic feet per minute for 50 men and 4 mules.
" Incline—17,320 " " 14 " 1 "

"The air is well conducted into the places where the men are at work, and the mine itself is free from dust and in good order. This mine is connected with the surface by means of the No. 1 slope, and although there is no mining being done in this slope, yet the air current is kept up throughout the works as though there was. The number of men which I have enumerated as above represents those on one shift only.

"Prospecting.

"For this purpose the New Vancouver Coal Co. employ a large staff. A portion of the prospecting is done within the mine itself, in parts where the existence of coal is a speculative probability, and in other places by means of the pick and shovel; but the diamond drill is the most far reaching instrument of which they avail themselves. I have in a former report stated that a bore hole had been sunk on the mud flat at the mouth of the Nanaimo River to a depth of a thousand feet, but this bore has since been discontinued. I have never ascertained the exact depth to which the bore was carried, but it was some considerable distance further than that mentioned, and the results were, I understand, satisfactory to the Company. The drill has a short time back been employed at a spot near the Indian Reserve, at the mouth of the Nanaimo River, when a hole was sunk to a depth of 1,200 feet, and in going down the drill passed through a workable seam of coal. It is now being removed to another place, where I hope they will be successful in finding a seam (or some seams) of coal of sufficient thickness that will justify the Company in sinking a shaft, and ultimately making a success of it.

"Nothing has been done by the N. V. C. Co. at their new opening near the E. & N. R. R. Co.'s 'Extension Mine.' This Company have built a large addition to their coal bunkers for the storage of coal, and are making improvements of an extensive kind at their wharves to facilitate the loading of coal whereby the vessels may obtain quicker dispatch.

"WELLINGTON COLLIERIES.

"These well-known collieries, the property of Messrs. R. Dunsmuir & Sons, are situated near the town of Wellington, about six miles from Nanaimo. Departure Bay, the shipping point, is three miles distant. Here the Company have taken advantage of the fine water front to erect extensive and commodious wharves furnished with every modern facility for loading their vessels. In addition to an office at the mines, this Company have also an office at San Francisco, but the head offices are at Victoria.

"No. 1 Pit (Wellington).

"This pit is situated at a point about one mile from Departure Bay, and close to the eastern boundary of their estate, and here the Company have done a great deal of prospecting and rock tunnelling with, during the past two years, a large out-put of coal and fire clay of a very superior quality. All of the mining now done on this pit is from a slope, as mentioned in a former Report. They are down close to their southern boundary, with levels from the same to the west. The coal here is good in quality, and is worked on the 'long wall' system, which seems to be the safest way of mining this coal, especially where they are troubled with a soft roof.

"Ventilation.

"The ventilation is good. When I was down in December there were 24,000 cubic feet of air passing per minute through the level, and 12,000 feet of this amount were going down the slope where 61 men and boys were at work. The air travels in through the level to the face, and returns by the face of the long wall, thence out to the up-cast, which is No. 1 shaft. Again, another 12,000 feet of the air supplied go out by the side slope in the No. 5 shaft at the fan shaft there.

"No. 3 Pit (Wellington).

"This mine is in connection with No. 4 Pit. No work has been done in this pit during the past year, with the exception of the pumping of water. A large area of pillar coal remains to be gotten out of this mine.

"No. 4 Pit (Wellington).

"This valuable mine has given the management much trouble through fires, which necessitated the filling of the mine with water on two occasions, and the flooding of the lower district a third time. All of the coal mining in this pit is now confined to the taking out of the pillars, of which a large number still remain, and which will give employment to a large number of men for some time to come.

"Ventilation.

"This is good, the motive power being a large fan. In December I found 48,600 cubic feet of air passing per minute, for the use of 70 men and 20 mules, the mine being ventilated on the separate split system, with the division at the shaft bottom, and the air divided as follows:—

To the East side	22,400	cubic feet per minute for	30 men.
" West "	26,200	"	40 "

"This mine is connected with No. 3 Pit, and also with what is known as No. 4 fan shaft.

"No. 5 Pit (Wellington).

"This pit has been, and is at the present time, not only the most extensive, but also the greatest coal-producing mine of the Wellington Collieries. Much of the coal mined in this pit is on the 'long wall' system, a considerable amount being derived from a section from which they are removing the pillars, but the district which is being mined on the 'pillar and stall' system is furnishing the largest amount. The total amount sent up from the latter section representing one-third of the total amount of coal area, two-thirds being left in the form of pillars for safety, to be removed at some future date. The coal in this district averages 8 feet in thickness, and it would be almost superfluous for me to write that it was good, as its quality is well known to the people of this coast. The area of coal still in sight justifies my saying that this mine will be a coal producer for some years to come.

PROSPECTING GOLD-GRAVELS IN ROSE'S GULCH, QUESNELLE FORKS.

SIX INCH MONITOR IN CARIBOO MINE, NEAR QUESNELLE FORKS.

"VENTILATION.

"The ventilation is good, though after firing of shots there is a considerable amount of powder smoke, which soon passes away. When down in December, there were 75,500 cubic feet of air passing per minute for the use of 170 men and 26 mules. This mine is ventilated on the separate split system, in four divisions, as follows:

To East side	17,000	cubic feet of air for	31 men and	5 mules.
" West side	7,100	" "	23 men and boys and	2 mules.
" Side slope	15,200	" "	53 " "	9 "
" Incline	35,900	" "	63 " "	10 "

"You will observe the large amount of air that is furnished to the east side, taking into account the number of men that are at work there. On this side all of the coal is got from the pillars, and in some of the places only locked safety lamps are allowed to be used. It is seldom that any gas is found there, but the lamps are used as a precaution, the old workings being close at hand and inaccessible, and not knowing what may be there, the safety lamps are used. No black powder is used in the foregoing places for the same reason. This mine is free from dust. In addition to the manager, this mine has a large staff of firemen (or assistants), who make a careful examination of the workings in every detail, and any serious change in the ventilation would thus be detected at once.

"NO. 6 PIT (WELLINGTON).

"This is another of the group of mines owned by this company. In this pit coal was originally mined on the pillar and stall system, and in that manner worked to the boundary. The company have now been working back, taking out the pillars as they recede. In course of time these will all be taken out, in addition to the boundary wall between this pit and the old East Wellington mine, which contains a considerable area of coal. In several places along the wall of this boundary the mining has been pushed so far that the drill has occasionally connected both mines.

"VENTILATION.

"In December there were 42,600 feet of air registered on the intake, and on the return, near the upcast, 44,500 cubic feet of air were passing per minute for the use of 58 men and 5 mules. The two registers, therefore, show a loss in expansion of 1,900 feet. This mine is ventilated on the separate split system, as follows:—

To West heading .	5,700	cubic feet per min.	No men working here.
" " level	3,800	" "	for 2 men.
" Dip	4,900	" "	" 14 " and 1 mule.
" East incline	10,200	" "	" 12 " " 1 "
" " level	6,700	" "	" 6 " " 1 "
" Jolly's level	7,200	" "	" 14 " " 1 "
" South level	4,100	" "	" 10 " " 1 "

"There are yet 1,900 cubic feet of air to be accounted for in loss and expansion. The above is the average during the year.

"ALEXANDRIA MINE.

"This mine is also the property of Messrs. R. Dunsmuir & Sons, and lying to the south of the New Vancouver Coal Company's Southfield, is entered by a slope from the surface. The slope was driven about 18 years ago, for a distance of 800 yards, when the work was abandoned. In 1896, work was resumed by driving a tunnel off the slope in a northerly direction, likewise for a distance of 800 yards. The greater part of this distance was in good coal, at times not very thick, and at other times the coal reached above the roof. For hauling the loaded cars out of the mine, a large double engine has been erected. A switch and a siding, the greater part of which has been double tracked, have been put in from the E. & N. R. R., to enable the company to carry off their coal, either to Wellington or Victoria, for shipment or sale. In this mine at the present writing, there are 30 men at work. The out put is about 120 tons per day, all of which is carried away on the E. & N. R. R.

"VENTILATION.

"The ventilation is good. The means used to produce a current is a furnace, which is placed at the up-cast, a short distance down the slope. In December, there were 10,780 cubic feet of air passing per minute for 30 men as above mentioned. The coal taken from this mine makes very fine coke. There have been some hundreds of tons taken from here to the Union coke ovens, where it has been converted into coke of a good marketable kind. It is possible that in the near future, we may see coke ovens built in this vicinity.

"THE WELLINGTON COLLIERY COMPANY'S MINES.

"This mine is situated on the south slope of Mount Benson. There are two slopes in this mine. No. 1, where there has been very little work done during the past year, was run down for the purpose of prospecting to a distance of 700 yards and along the whole course of the drift, it was in good coal, from 6 to 11 feet thick. The management being satisfied with the prospects of No. 1, turned their attention to driving another slope, at a distance of two miles, in a south-easterly direction at the out-crop. Here, where the coal was 15 feet thick, they drove a slope down 400 yards with a counter slope as return airway. This slope is taken out at an uniform height of 8 feet, leaving a coal roof above. Here and there in the roof, a drill hole has been put in, to ascertain the thickness of the coal still remaining above them, and some of these holes have been driven in 6 feet without touching the proper roof. In the whole length the rock has been only exposed once. From what I have seen, this Douglas District will be the coal producing centre of Vancouver Island for the next generation. Near the entrance of this slope is a large double steam engine as well as an air compressor. The Company further contemplate driving a tunnel in at a lower level so as to tap this great coal basin. This tunnel will be a mile long, and will be the main opening of this field. The Company have also sunk five bore-holes, to ascertain the extent of the coal area, and there are yet some more to be put in.

"WEST WELLINGTON COLLIERY.

"This prospect is situated west of the Wellington Colliery, and is owned by the West Wellington Coal Company, Limited.

"But little mining has been done here during the past year. Some good coal was taken out, but not having the facilities to carry it to market the mine was stopped. This Company has bonded the rights of a large estate near Nanoose Bay, and on this they are now putting down a prospect hole with a diamond drill. We may yet see a large colliery in operation in this district under the control of this Company.

"UNION COLLIERY (COMOX).

"This colliery is the property of the Union Colliery Co., and is situated at the extreme end of the farming district of Comox. The mines and the farming settlement are connected by means of a good road which enables the farmers to find a market for their produce among those who work at the colliery.

"NO 2 SLOPE.

"I have already stated in a former report that this slope was down 700 yards, and at the time of the then writing was standing idle from a slackness in the coal trade. It is a pleasure to state that, the trade having improved, work is now being carried on. The system of mining carried on here has been on the pillar and stall, and here, as in all the other mines of this district, the pillars constitute fully two-thirds of the original area of coal. In addition to still pushing the pillar and stall, many of the first pillars left standing are being taken out, which are producing first-class coal.

"VENTILATION.

"This is good. Motive power, a Guibal fan. When I last tested the air current there were 21,000 cubic feet of air passing per minute for the use of 53 men, who at that time were employed there. The mine is in good order, having a strong roof.

"NO. 4 SLOPE (UNION).

"This is the most extensive mine in the Union Colliery. I have already mentioned in a former report, that this slope was down 2,400 yards, and no extension of it has been made during the past year. The No. 2 (diagonal) slope has, however, been driven down quite a distance, all in good coal and on the true dip, so that the pitch is much greater, although the distance travelled to reach the same vertical depth is shorter. From the main slope there are four levels to the west side, known as Nos. 10, 11, 12 & 13, west levels. There are also three levels to the east side, but with the exception of one they are all cut by the diagonal slope, so that they now form part of the diagonal district. The coal in this mine is generally hard and of good quality.

"VENTILATION.

"The ventilation is good. An observation taken by me in December, showed that there were 45,000 cubic feet of air passing per minute for 198 men and 15 mules.

"This mine is ventilated on the separate split system, the first split being near the entrance of the mine, where the No. 2 or diagonal slope branches off No. 4 slope, part going down the diagonal, and part going down the No. 4 or main slope. At this split I found there were 22,000 cubic feet of air going down the main slope. When near the bottom the air is again split, 10,000 feet of it going into what is known as the No. 1 division, which is on the west side, to supply 58 men and 4 mules at work there. Through the No. 2 division which goes to the east side, there were 8,000 cubic feet of air passing for the demands of 38 men and 3 mules. Returning to the point where the first split occurred, which is at the junction of the No. 2 and the No. 4 slopes, my observation gave 24,600 cubic feet of air per minute, as passing down the No. 2 (or diagonal) slope. This current is again split near the bottom to the east and west sides of the slope, which are known as the No. 3 and No. 4 divisions. To the No. 3 or west side district, there were 12,000 cubic feet of air passing per minute, for the use of 59 men and 5 mules. To the No. 4 or east side district, there were 10,000 cubic feet of air passing for 43 men and 3 mules—there were, therefore, 5,000 feet to be accounted for; this quantity was escaping at the doors at the different levels of the slopes, but it is not lost, as it is caught on the level where it escapes, and conducted into the face, it also serves to keep the road of the level clear of foul air. This mine is free from dust. All the appliances and arrangements both in and about this mine, are on the most improved system for the saving of labour in the handling of coal.

"NO. 5 SHAFT (UNION).

"This shaft and its machinery have been fully described in a former Report.

"In this pit the Company have been much troubled with faults of one kind and another. In some cases there has been an 'upthrow' of the coal; at another time the coal has either been wanting, or it has been a 'downthrow,' and again, sometimes the trouble has been in the presence of soft shale in the centre of the seam. But with all of these drawbacks, they manage to get out quite a large quantity of first-class coal. All of the mining at present done here is to the south of the shaft, and is on the 'long wall' system, for which the mine is well adapted, as after it is opened out the weight of the roof presses it over the face of the coal, making it almost loose, and thereby requiring but little powder.

"VENTILATION.

"The ventilation is good, the motive power being a Guibal fan. In the examination of the air current last December, there were 40,000 cubic feet of air passing round the mine per minute, for the use of 48 men and 3 mules. The ventilation is here likewise on the separate split system, the first division being at the foot of the shaft, to the east and west sides. To the east, 17,000 cubic feet per minute for 35 men and 3 mules; to the west, on the westward side of the shaft, 21,000 cubic feet per minute for 13 men. The mining being on the longwall system, the air has a clean sweep along the whole face of the workings. In addition to the above amount of air, there are 2,000 feet of it which escape at the doors, and which again supply any person in the roads with fresh air. Before leaving this mine, I might mention that there is, as yet, but one outlet by which the men working within the mine can get out. I respectfully refer you to my former Report for further details. In the area of the surface of this mine a series of drill holes have been put down to various depths (from 600 to 1,000 ft.) to ascertain whether there was sufficient coal to justify them in sinking a shaft for a connection or an outlet to No. 5.

"The manager of this extensive work has now determined upon putting down another shaft, and with this in view they are working below ground towards a point which will be close to the shaft when sunk. As the wet season came on before their boring operations were finished, the sinking of the shaft has been deferred to as early a period sa possible in the spring. Under the above conditions, the manager applied for a permit under section 28, sub-section 2, paragraph (*a*) of the 'Coal Mines Regulation Act' to employ 40 men in addition to those mentioned in section 28, sub-section 1. The permit was granted on the conditions above mentioned.

"In addition to the extensive prospecting done in and about this colliery by the Union Colliery Co., some extensive works have been built near the shipping wharf. A 'Luhrig' washer and 'breakers,' to grind up the coal required for the coke ovens, have been erected. I mentioned in my last Report that this Company had erected 100 ovens for the manufacture of coke, from which the coal from the Union Colliery is well adapted. The above-mentioned ovens did not come up to expectations, so they were taken down and rebuilt during the past summer. These are now all at work, making a first-class coke, which commands a ready sale, both in this Province and in California, where it is also being used. Finding that the first outlay has been justified by the demand and sale of the product, the Company are now erecting 100 more ovens, which, if the weather proves favourable, will be ready in the spring. The fire-bricks and blocks used in the building of these ovens have been made from fire-clay mined in the Union Colliery. The transforming from clay to brick is effected in Victoria, to which point the clay is shipped and there made into the shapes required. Close to the ovens have been erected some large bunkers to receive the fine coal as it comes from the 'breakers' and washer. In these bunkers there is constantly on hand to supply the coke ovens, a large stock of coal, in case of any temporary stoppage of the washer. Bunkers, having a capacity of 4,000 tons, have also been erected near the shipping wharves for the storage of coal when there are no ships at the wharf to take it in."

THE CROW'S NEST PASS COAL COMPANY, LIMITED.

This Company takes its name from the pass in the Rocky Mountains where the Canadian Pacific Railroad Company is now building the second railway of the Company from Alberta into British Columbia.

The Crow's Nest Pass Coal Company is now opening out coal mines to the north and south sides of Coal Creek, in Crow's Nest Pass, and about 35 feet above the level of the grade for the railways.

On the north side of the above-named creek they have what is known as No. 1 tunnel. This is now in 190 feet, and 30 of this is in what is termed the 6-foot seam. This coal is hard and clean; what they have tried makes a good hard coke.

On the south side of Coal Creek they have what is called No. 2 tunnel, now in 220 feet, in coal all the distance. This seam is 7 feet thick, and is termed the Jaffray seam. This is softer than the coal mined in No. 1 tunnel. In addition to its coking qualilies, it is good for blacksmith purposes. The coal now being worked in No 2 tunnel is 40 feet above (overlying) that worked in No. 1.

In the above works there are now 20 men employed.

"ACCIDENTS

"IN AND ABOUT THE COAL MINES OF BRITISH COLUMBIA FOR THE YEAR ENDING THE 31ST DAY OF DECEMBER, 1897.

January 21—Daniel Martin, runner in Protection shaft, was severely injured about the head and body by a loaded car in the mine.

February 6—John Thomson, overman, and Edward Austin, timberman, of No. 5 pit, Union Colliery, were burned about the face and hands in the 'Old Workings' by an explosion of gas.

〃 6—Ah Chung, labourer in No. 5 shaft, Union Colliery, had his arm broken while at work.

〃 12—Edward Berry and John Hoggan, miners, working in No. 4 pit, Wellington Colliery, were slightly injured by a fall of coal while at work.

〃 23—Robert Jones, miner, got his shoulder dislocated and also received other slight injuries by a fall of rock while at work in No. 1 shaft, Wellington Colliery.

March 18—Samuel Jones, mule driver, in No. 4 pit, Wellington Colliery, got his leg broken by a mule falling on him.

March 27—James Lewis, miner, working in No. 4 slope, Union Colliery, got the small bone (fibula) of his leg broken by a stringer falling on him while in the act of setting it up.

April 27—Albert Taylor, miner, working in No. 1 shaft, Nanaimo Colliery, was slightly burned about the neck and hands by an explosion of gas.

June 2—Henry Rosewall, miner, while at work in his stall in Protection shaft, Nanaimo Colliery, had one leg broken by a fall of coal.

〃 2—Wm. Jones, runner, in Protection shaft, was severely bruised about the legs by getting jammed by a loaded car in the mine.

〃 10—J. E. Calman, miner, working in No. 4 slope, Union Colliery, was hurt by a piece of rock falling on him while at work.

〃 12—A. Protery, miner, working in No. 4 slope, Union Colliery, was slightly hurt by a piece of rock falling on him while at work.

〃 16—Charles Paul, runner in Protection Shaft, Nanaimo Colliery, was killed by a fall of rock from the roof of a stall.

〃 16—Mah Soot, loader, and working in No. 4 slope, Union Colliery, had his leg broken by a stringer falling on him.

〃 18—Matthew Cottle, miner in Protection shaft, Nanaimo Colliery, was hurt about the back by a fall of rock.

July 29—James Kendall had his leg broken by falling from the elevator tower at No. 4 slope, Union Colliery.

August 7—James Glen, miner in No. 4 pit, Wellington Colliery, got his arm broken by a mine car.

〃 9—Ah Lun, labourer, who had been directed to keep on the travelling road, but who persisted in walking between the rails, was killed by the cars in No. 4 slope, Union Colliery.

September 13—Robert Galloway, miner, working in the Alexandria Mine, was hurt about the back by a fall of coal.

〃 27—J. Taniguchie, labourer in No. 4 slope, Union Colliery, was killed on the slope, being overtaken by the cars while trying to re-light his lamp

October 22—William Challoner, miner, while at work in No. 1 shaft, Nanaimo Colliery, sustained a fracture of the collar bone by the falling of a piece of coal.

〃 25—Thomas Myles, miner in No. 1 shaft, Nanaimo Colliery, was severely injured about the back and the lower part of the body by a fall of coal from the face.

October 28—Jap, a labourer, in No. 4 slope, Union Colliery, was burned about the face and arms by an explosion of gas.

November 13—Robert Potts, miner, working in No. 5 shaft, Nanaimo Colliery, was severely injured about the body by a fall of rock while at work.

〃 19—Robert Potts died to-day.

〃 23—N. Boyde, miner, working in the Alexandria Mine, had his face badly cut by fall of rock.

〃 26—Jacob Haapal, miner, working in No. 1 shaft, Nanaimo Colliery, sustained a dislocation of his knee joint by the cage landing too heavily on the bottom of the shaft, causing him to fall and twist his leg.

〃 30—John Benaski, mule driver in No. 4 pit, Wellington Colliery, got his back injured by being jammed between a box and a stringer.

December 1—Andrew Stewart, mule driver in No. 6 pit, Wellington Colliery, was killed by a fall of coal while at work.

〃 3—William Palmer, mule driver in No. 5 pit, Wellington Colliery, got his foot broken by the fall of a piece of rock.

〃 17—Andrew Dumont, miner, working in No. 6 pit, Wellington Colliery, got his foot injured by a fall of rock from the roof.

〃 29—Roland James, rope runner in No. 4 slope, Union Colliery, was seriously injured by falling under the empty cars, and died in the evening of the same day.

"Once more I must express regret at the close of another year that I have to make out the foregoing long list of accidents, both fatal and otherwise. Although there is a marked decrease in the number, still I must say that in my opinion there was a large number that might, with ordinary caution, have been avoided.

"In the list given you will observe that there are 33 accidents in all, six of these being fatal, and the balance reported as slight. Of the latter, five were from the falling of coal, nine from rock, four from explosions of gas, four from cars in the mines, one by a kick from a mule, two from stringers while in the act of setting them up, one from the cage in the shaft, and another by a fall from an elevator. Of the fatal accidents, one was caused by a fall of coal, two by the falling of rock, and three from the cars in the mines. In all of the accidents mentioned there were not more (except on two occasions) than one person injured at a time. I made inquiries on all occasions, as to the circumstances of and the causes of these accidents, as soon as possible after the receipt of notice from the manager. On many occasions I have been on the spot before receiving the notice. With one exception, all of the accidents mentioned happened while the injured parties were at work. In the case of fatal accidents, an inquest was invariably held, and the evidence and inquisition filed with the Attorney-General's Department, for the information of the Government.

"I can only repeat here what I have mentioned in previous reports, that in addition to the workman himself who is supposed to use ordinary care and precautions for his own safety, there is in all of the collieries a large staff of assistants employed to look after the safety of those working below. For instance: There are the manager, overman, fireman, and shot examiner, and many others having authority, all of whom are constantly moving about the works, and throughout the mine. The fireman and shot examiners are always provided with safety lamps, for the purpose of examining any places which are likely or are suspected to contain gas, the most dreaded of all dangers to the coal miner. All of the old works which can be got at or visited are frequently examined, and more especially is this the case where they are taking out pillars. In this way the condition of the mine is constantly and accurately known, as to the prevalence or otherwise of gas.

"Once more have I to record that the miners of the Nanaimo Colliery are the only workmen who have as yet availed themselves of the privileges allowed them under General Rule 31, 'Coal Mines Regulation Act.' This privilege is the examination by committee of themselves of the mine and its condition as regards safety. The results of these examinations are posted up in a conspicuous place for the information of the men, and are also entered in a book kept for the purpose.

"Although there has been a decrease in the number of casualties and fatal accidents in the mines during the past year, there is still room for improvement, as many of the accidents have been preventable, under proper precautions; but we can only hope that the future will witness a satisfactory improvement in this regard.

"I append hereto the annual colliery returns for 1897."

COLLIERY RETURNS.

NANAIMO COLLIERY RETURNS FOR 1897.

Output of coal for 12 months ending December 31st, 1897.		No. of tons sold for home consumption.		No. of tons sold for exportation.		No. of tons on hand 1st January, 1897.		No. of tons unsold, including coal in stock, Jan. 1st, 1898.	
Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.
319,343	14	85,683	17	231,986	10	3,067	4	4,720	11

Number of hands employed.				Wages per day.			
Whites.	Boys.	Indians.	Chinese.	Whites.	Boys.	Indians.	Chinese.
641	44	....	111	$2.37 to $3.50	$1 to $2	....	$1 to $1.25
Total hands employed 796				Miners' earnings, per day .... $2.75 to $4.50.			

Name of Seams or Pits—Southfield No. 2, Southfield No. 5, No. 1 Esplanade Shaft, No. 1 Northfield Shaft, Protection Island Shaft.

Value of Plant—$350,000.

Description of seams, tunnels, levels, shafts, &c., and number of same—Southfield No. 2, worked by slope, seam 6 to 10 feet; Southfield No. 5, worked by shaft, seam 5 to 10 feet; No. 1 Northfield Shaft, worked by shaft, seam 2 feet to 3 feet 6 inches; Protection Island Shaft, worked by shaft, lower seam 4 feet, upper seam 6 feet; No. 1 Esplanade Shaft, worked by shaft, seam 5 to 12 feet.

Description and length of tramway, plant, &c—Railway to Southfield, 6 miles, with sidings; railway to No. 1 Shaft, 1 mile, with sidings; railway from Northfield Mine to wharf at Departure Bay, 4½ miles; rails are of steel, 56 lbs. per yard, of standard gauge, viz., 4 feet 8½ inches; 8 hauling and pumping engines, 15 steam pumps, 5 locomotives, 238 coal cars (6 tons), besides lumber and ballast cars; bunkers with a capacity of 4,700 tons; fitting shops for machinery repairs, with turning lathes, boring, drilling, planing, screw-cutting machines, hydraulic press, steam hammer, &c., &c.; diamond boring machinery for exploratory work (bores to 4,000 feet); 150 horse-power electric plant engines, boilers, dynamo; 4 30 horse-power 8-ton locomotives, and 1 15 horse-power locomotive; hauling and lighting equipment; wharves, 2,000 feet frontage, at which ships of the largest tonnage can load at all stages of the tide.

SAMUEL M. ROBINS,
Superintendent.

WELLINGTON COLLIERY RETURNS FOR 1897.

Output of coal for 12 months ending December 31st, 1897.		No. of tons sold for home consumption.		No. of tons sold for exportation.		No. of tons on hand 1st January, 1897.		No. of tons unsold, including coal in stock, Jan. 1st, 1898.	
Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.
297,611	15	91,246	3	211,662	5	14,634	9	9,337	16

Number of hands employed.				Wages per day.			
Whites.	Boys.	Japanese.	Chinese.	Whites.	Boys.	Japanese.	Chinese.
631	75	8	83	$2.25 to $3.50	$1 to $2	$1 to $1.50	$1 to $1.50
Total hands employed 797				Miners' earnings, per day .... $2.50 to $3.50.			

Name of Seams or Pits—1, 3, 4, 5, and 6 Wellington, and 1 and 2 East Wellington.

Value of Plant—$150,000.

Description of seams, tunnels, levels, shafts, &c., and number of same—7 shafts, with slopes, airways, and levels; 3 air shafts.

Description and length of tramway, plant, &c—5 miles of railway, with sidings and branches; 6 locomotives; 250 coal cars; 13 stationary engines; 9 steam pumps; 4 wharves for loading vessels, and bunkers.

Output of fire-clay—405$\frac{14}{20}$ tons; sold, 405$\frac{14}{20}$ tons.

R. DUNSMUIR & SONS.

UNION COLLIERY RETURNS FOR 1897.

Output of coal for 12 months ending December 31st, 1897.		No. of tons sold for home consumption.		No. of tons sold for exportation.		No. of tons on hand 1st January, 1897.		No. of tons unsold, including coal in stock, Jan. 1st, 1898.	
Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.
265,642	—	98,687	—	176,212	—	14,410	—	5,153	—

Number of hands employed.				Wages per day.			
Whites.	Boys.	Japanese.	Chinese.	Whites.	Boys.	Japanese.	Chinese.
425	32	72	225	$2.25 to $3.50	$1.25 to $1.50	$1 to $1.25	$1 to $1.50
Total hands employed 754				Miners' earnings, per day .... $2.50 to $4.50.			

Name of Seams or Pits—Comox. Value of Plant—$125,000.

Description of seams, tunnels, levels, shafts, &c., and number of same—No. 2 Slope; No. 4 Slope, with airway and levels; No. 5 Shaft, with airway and levels.

Description and length of tramway, plant, &c.—12 miles railway, 4 feet 8½ inches gauge; 4 locomotives; 150 coal cars (25 tons each); 1 second-class passenger car; 1 combination passenger car; 1 diamond drill; 4 stationary engines; 5 steam pumps; 5 electric pumps; 1 dynamo; 1 steam saw-mill; 1 Luhrig coal washer; 100 coke ovens (Beehive pattern); 2 wharves; 1 pile-driver.

No. of tons of coke sold—$17{,}101\frac{11}{20}$. Coke on hand—730 tons.

" " fire-clay sold—1,223.

JAMES DUNSMUIR, *President.*

WELLINGTON COLLIERY RETURNS FOR 1897.

Output of coal for 12 months ending December 31st, 1897.		No. of tons sold for home consumption.		No. of tons sold for exportation.		No. of tons on hand 1st January, 1897.		No. of tons unsold, including coal in stock, Jan. 1st, 1898.	
Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.
6,000	—	—	—	—	—	4,000	—	10,000	—

Number of hands employed.				Wages per day.			
Whites.	Boys.	Indians.	Chinese.	Whites.	Boys.	Indians.	Chinese.
15	....	....	6	$2 to $3	....	....	$1 to $1.25
Total hands employed 21				Miners' earnings, per day .... $3 to $4.			

Name of Seams or Pits—Wellington.

Value of Plant—$1,000.

Description of seams, tunnels, levels, shafts, etc., and number of same—Nos. 1 and 2 slopes, with airways.

Description and length of tramway, plant, etc.—1 boiler and hoisting engine.

JAMES DUNSMUIR,
President.

Alexandria Colliery Returns for 1897.

Output of coal for 12 months ending December 31st, 1897.		No. of tons sold for home consumption.		No. of tons sold for exportation.		No. of tons on hand 1st January, 1897.		No. of tons unsold, including coal in stock, Jan. 1st, 1898.	
Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.
3,375		14,375				12,000		1,000	

Number of hands employed.				Wages per day.			
Whites.	Boys.	Indians.	Chinese.	Whites.	Boys.	Indians.	Chinese.
27	....	....	10	$2 to $3	......	....	$1 to $1.25
Total hands employed			37	Miners' earnings, per day			$3 to $4.

Name of Seams or Pits—Alexandria.

Value of Plant—$2,000.

Description of seams, tunnels, levels, shafts, etc., and number of same—No. 1 slope, with air-way and levels.

Description and length of tramway, plant, etc.—Boilers and hoisting engines.

James Dunsmuir,
Vice-President.

West Wellington Colliery Returns for 1897.

Output of coal for 12 months ending December 31st, 1897.		No. of tons sold for home consumption.		No. of tons sold for exportation.		No. of tons on hand 1st January, 1897.		No. of tons unsold, including coal in stock, Jan. 1st, 1898.	
Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.
323	10	317	10	—				6	

Number of hands employed.				Wages per day.			
Whites.	Boys.	Indians.	Chinese.	Whites.	Boys.	Indians.	Chinese.
8	....	....	....	$2.50			
Total hands employed			8	Miners' earnings, per day			$2.50

Name of Seams or Pits—West Wellington.

Value of Plant—About $2,000.

Description of seams, tunnels, levels, shafts, etc., and number of same—One slope, seam, from 5 to 6 feet thick; 2 levels; no shaft.

Description and length of tramway, plant, etc. Wooden tramway, 6½ miles long, to Nanoose Bay; 1 steam pump, hoisting engine, trucks, etc.

West Wellington Coal Co., Ltd. Ly.,
Wm. Sulley,
Acting Secretary.

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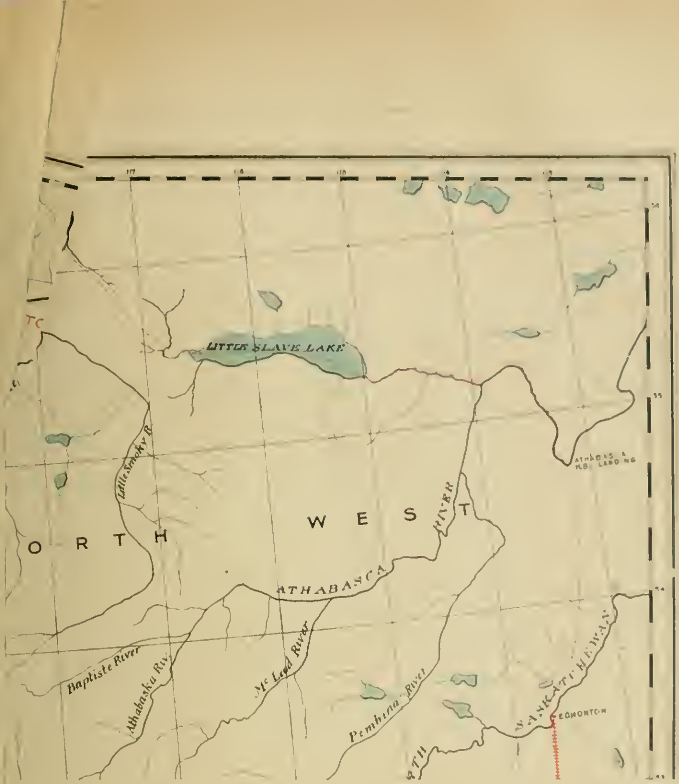
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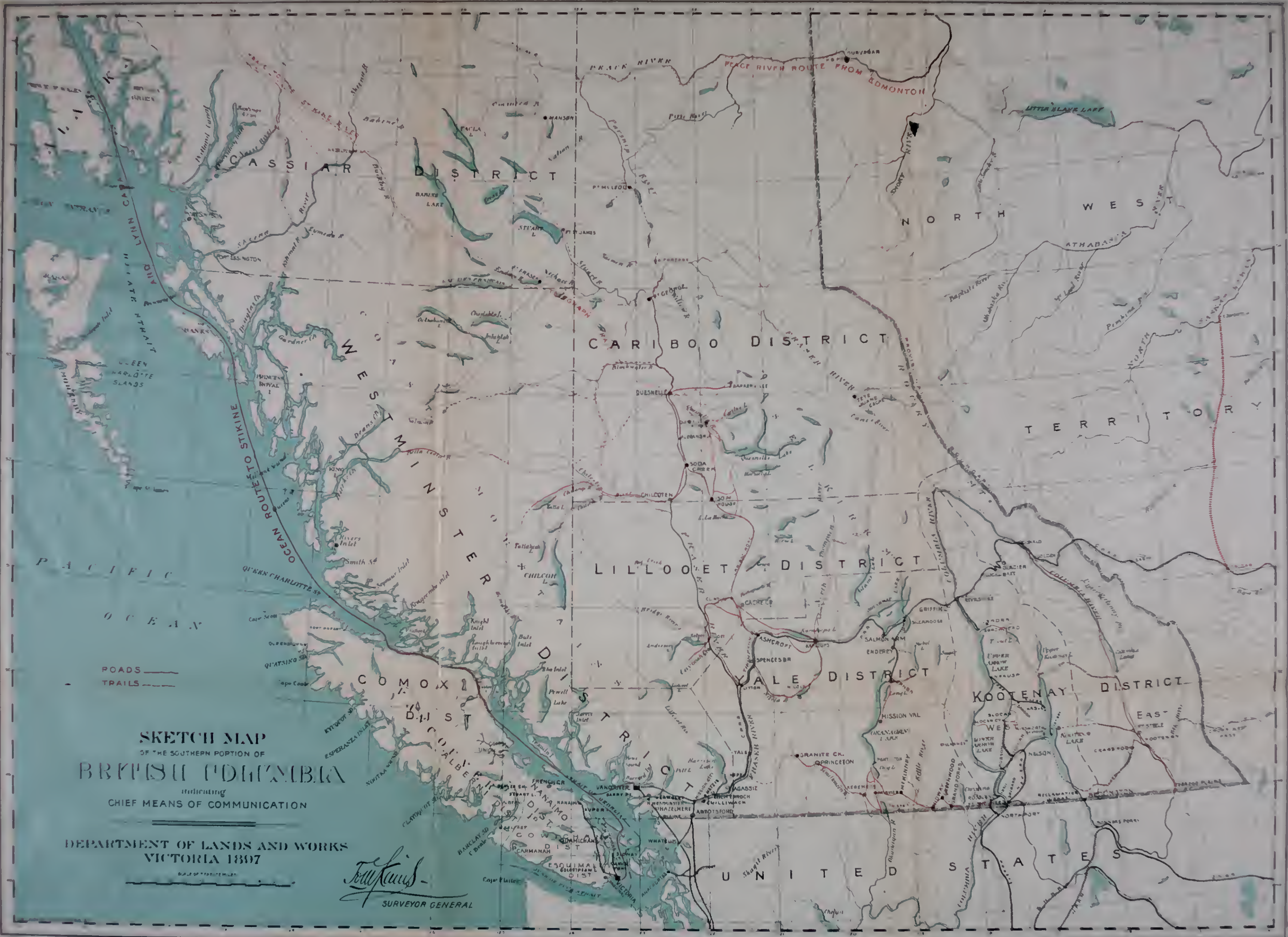

SKETCH MAP

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DEPARTMENT OF LANDS AND WORKS
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